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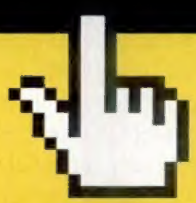

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Michael J. Miller

E-Relationships Are Vital

When you think of e-commerce, the first thing that probably pops into your mind is selling things online. If asked for an example, you're likely to mention Amazon.com. Those are fine answers, because selling online is the most visible part of e-commerce, and Amazon.com is an excellent model. Amazon is not only the most visited shopping site in our recent survey of *PC Magazine* readers, it is also receives the top rankings for overall satisfaction. (See "Readers Rate the Web," page 125.)

But e-commerce is a lot more than a few big online stores selling goods directly to consumers. Rather, it's about redefining the relationship between buyers and sellers.

Whenever you buy anything online—or even when you just visit a site—you are establishing a relationship with the site. Perhaps you enter some amount of personal information, from an e-mail account to more confidential information such as an address or credit card number.

Sometimes, it's an explicit relationship: You register and give specific information about yourself. Sometimes it's an implicit relationship: The site can track where you came from and what you view, but it may not know exactly who you are. In either case, there's an implied agreement. In exchange for viewing the contents of the site, you give the site some information and an opportunity to sell you things.

E-commerce is about redefining the relationship between buyers and sellers.

How the site manages that relationship often determines whether you'll return, how often you'll return, and how likely you are to buy from that site instead of from its competition.

Good sites store information about your personal preferences, along with a list of things you are interested in, and generally make life easier for you. They may give you personalized views of their sites, so you see only the information you want.

If you're a customer, managing all this information is complex. Why do you need to fill out similar forms repeatedly as you move from site to site? The answer is you shouldn't. A number of products, from Novell's Digitalme to Microsoft Passport, try to do it all for you. None of these products are quite ready, but they are moving in the right direction.

If you're a seller, making all this work is even more complex. The market seems to be fragmenting quickly between two extremes. On the high end, many big sites have built their own solutions. But over time, we've begun to see products aimed at big enterprise customers from companies like BroadVision, Intershop, Interworld, and Open Market. The typical customers are big companies, companies that provide hosting for smaller firms, and new companies that are starting from scratch and building their whole businesses around e-commerce. In many cases, these solutions are then overlaid with customer relationship management software, designed to track customer preferences and interests.

For smaller sites, we're seeing mostly outsourced solutions, where an ISP sets up the basic software and gives you various options for customizing your site, such as the services we review in this issue (page 137). These solutions can get you up and running quickly.

In between, there remain a number of solutions for those who want to host and build sites themselves. Some of these solutions, like the latest version of Filemaker Pro, look good. Typically, they don't offer the most advanced forms of customer tracking, but they do give you more control than the off-the-shelf packages.

One thing is becoming clear: Just putting up a storefront isn't enough. You need to pay attention to creating a friendly online environment where your customers can find you, see what products you offer, and place and track orders. But you need to understand that when you set up an e-commerce site, you are also setting up the relationships with your customers and suppliers that may well define how they see you.

Often I hear employees of Internet start-ups say things like "It's a battle for eyeballs." That statement just scratches the surface of the relationship. The real battle isn't just to get people to visit a site but to get them to establish a loyal relationship.

And that's not a battle for eyeballs. It's a battle for trust, hearts, and minds. PC

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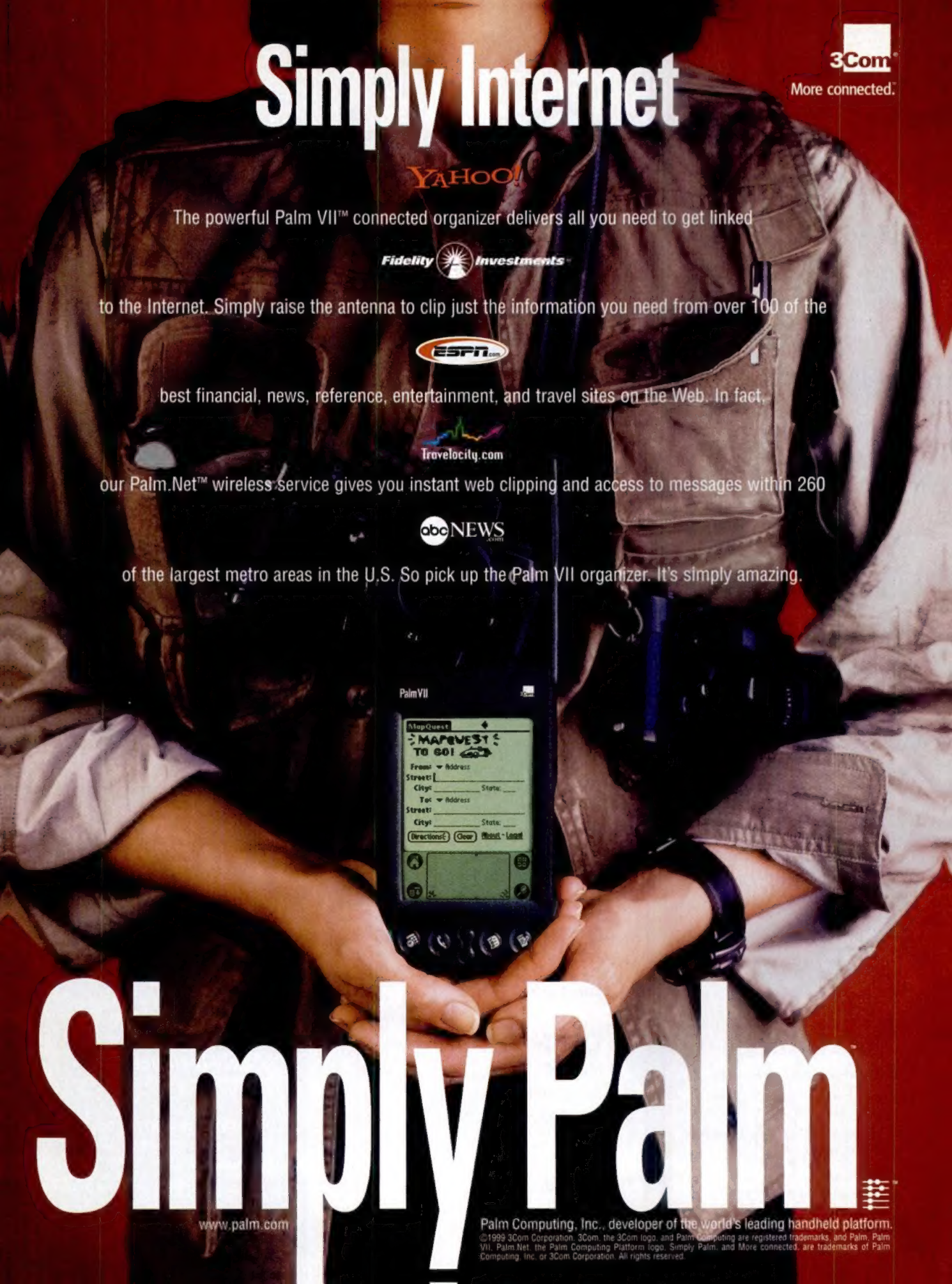
More on the Web:
Editor-in-chief Michael J. Miller answers your computing questions every Tuesday, exclusively at PC Magazine Online.
www.pcmag.com/miller



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Cover: Illustration by Jack Harris (bottom); photography by Thom O'Connor (top)

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It's beginning to look a lot like e-Christmas. Shopping is easier than ever, but with so many sites to choose from, finding what you want can be a chore. We help you separate the winners from the losers.

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125 Readers Rate the Web

In our first-ever comprehensive survey of Web site preferences, we asked 4,000 readers about the stores, portals, auction sites, and online brokerages they visit most often. *By Michael J. Miller*

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Photo Editing's Future

For some of us, taking a decent photo can be a shot in the dark, and the prospect of then touching it up with the powerful image editing tools available today is just asking for a digital disaster.

With Q-Research's recently released Photogenetics, you can touch up a photo by comparing your original with variations created by the software. You use a slider bar below the photos to indicate how much better the photo on the right is compared with your original photo on the left. It continues to "evolve" the photo, correcting such details as sharpness, color balance, and brightness until you're satisfied.

Meanwhile, digital photo editing is moving off PCs completely and into the living room. Digital Intelligence, a spin-off from graphics software developer Adobe Systems, is leading the way with a compact imaging technology called Picture IQ that can be embedded into information appliances such as the Sega Dreamcast game console. The Dreamcast will be the first home entertainment and information system that not only lets you view but also edit, enhance, organize, store, and share digital photographs. Highly automated functions and simple, one-click command buttons will let you run the program using a hand-held remote control, all while relaxing on the couch.

And starting in the first quarter of 2000, some new scanners will have the built-in smarts to touch up photos before they even appear on your computer. Applied Science Fiction's Digital ICE^3 is designed to eliminate surface defects, correct overexposure, and restore color quality to old photos. It all takes place during the image-capture process, which takes you out of the picture.

REMOTE CONTROL: *Picture IQ will appear in the Sega Dreamcast game console.*

IMAGE EVOLUTION: *Q-Research's Photogenetics does the touch-up for you.*

of respondents to a recent PC Magazine Online poll told us that they use 3Com Palm devices. Another 12 percent aren't yet, but say they want to be. 16 percent said they're interested in trying the new Handspring Visor device, and 38 percent said they have no interest in Palm or Palmlike devices.

The Richest Nerds

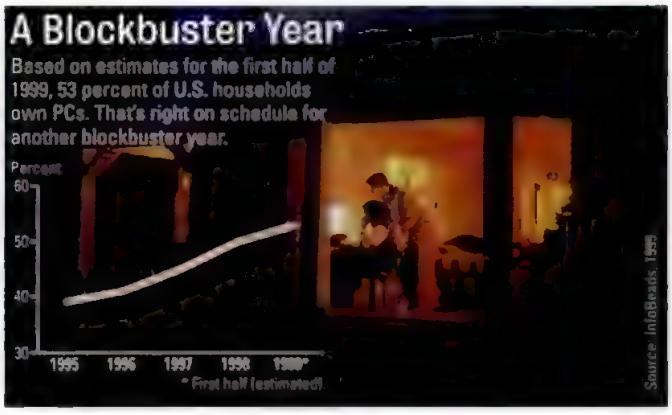
Forbes' 1999 roundup of the 400 wealthiest Americans featured a golden collection of technology-driven fortunes. Four of the top ten richest Americans are computer industry executives (shown here), and three of those four owe their successes to Microsoft.

Of 60 new names arriving on the list this year, 19 are Web billionaires, with eBay's Pierre Omidyar atop the money mountain with $4.9 billion. A whopping 71 members of the Forbes 400 derived their fortunes from technology and software.

At $85 billion, Microsoft's Bill Gates still holds his usual number-one spot. His net worth rose an almost unimaginable 46 percent over 1998.

Home PC Boom

This year is on schedule to be another record-breaker in home PC purchases, according to InfoBeads' Technology User Profile Study. As of July, almost 53 percent of U.S. households owned PCs, up from 39 percent for all of 1995. In the first half of 1999, 2.9 million households bought their first PCs, more than the 2.8 million added in all of 1996. Accompanying the growth is a shift in the demographics of home PC buyers. PC-owning households used to rank among the income and education elite, but in the last few years, more lower- and lower-middle–income households have been buying PCs. That's starting to make the typical PC household look a lot more like the typical U.S. household. According to market research firm Odyssey, 37 percent of U.S. households with PCs now have online access, up from 33 percent in January.



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PIPELINE

Major Math

As far as math problems go, this one was a doozy. It was so big, in fact, that it required 195 volunteers, 40 days of calculation, 16,000 MIPS years of computation, and 740 computers located in 22 countries. The challenge was to crack a private security key given a list of public keys. The volunteer mathematicians recently confirmed the theoretical predictions that a 97-bit code based on elliptical curves is harder to break than a 512-bit code based on factorization. The latter method is used in RSA security, the most widely used approach to security today.

To encourage research into the security applications of elliptic curves and strengthen the case for ECC (elliptic curve cryptography), Canadian company Certicom launched a series of increasingly difficult challenge problems in November 1997. The amount of effort expended by the winners provided an index of the strength of ECC.

The most recent problem involved a set of nearly 10^{29} points on an elliptic curve. The participants calculated 119,248,522,782,547 (over 10^{14}) of the points using open-source software developed by Robert Harley, an Irish mathematician. The project used twice as much computation as that used for the recent factorization of a 512-bit RSA number.

The project is "a great achievement that demonstrates the value of fruitfully harnessing some of the huge computational power of the Internet, which is idle most of the time," says Andrew Odlyzko, head of mathematics and cryptography research at AT&T Labs. "It validates theoretical security predictions and demonstrates the need to keep increasing cryptographic key sizes to protect against growing threats," he says.

Are You Being Tracked?

A global positioning system (GPS) receiver can help you find your way on the high seas or highways, but it can't help you find your way to a lost object, such as a notebook computer. And it can't track parcels on a factory floor or locate automobiles in giant parking lots, either. That's because all those tasks require pinpoint accuracy, which GPS can't handle. (And GPS doesn't work indoors.) A company called PinPoint *(www.pinpointco.com)* has devised what it's calling a local positioning system. Its product, called 3D-iD, uses high-frequency tags that wirelessly communicate via antennas and cell controllers. The cell controllers calculate the object's location, transmit the data over an intranet, and present the results on-screen. Designed for asset tracking, 3D-iD can pinpoint a wheelchair in a hospital, inventory in a factory, and, perhaps one day, a person in an airport.

ILLUSTRATION BY JENNIFER HERBERT (TOP), HAL MAYFORTH (MIDDLE), CHRISTOPH HITZ (BOTTOM)

THIS ISSUE'S CONTRIBUTORS: *Carol Levin, Sharon Nash, Sebastian Rupley, Luisa Simone.*

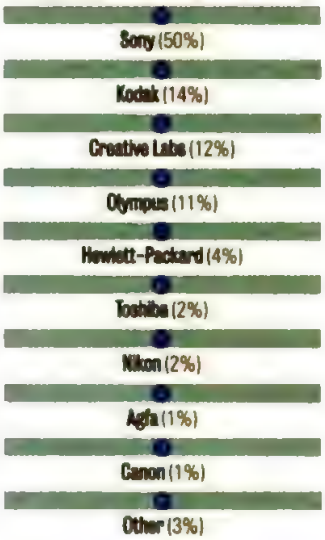
Hotel Internet

Along with a chocolate on your pillow, high-speed Internet access is the latest offering in hotel amenities. Broadband access to the Internet is becoming more available on the home front and at the office, but it's back to 28.8 Kbps at most hotels. That's all starting to change.

Internet company STSN has formed a partnership with Marriott International to provide high-speed Internet access in Marriott Hotels, Resorts, and Suites, Renaissance Hotels and Resorts, and Courtyard by Marriott hotels in North America. STSN is promising speeds up to 50 times faster than standard dial-up access.

Guests will be able to plug into the system using either an Ethernet or USB cable. The system combines voice and data capabilities, so you can talk on the phone while you're online. Over 42,000 guest rooms are expected to have the system by January 2000.

Top Digital Camera Vendors



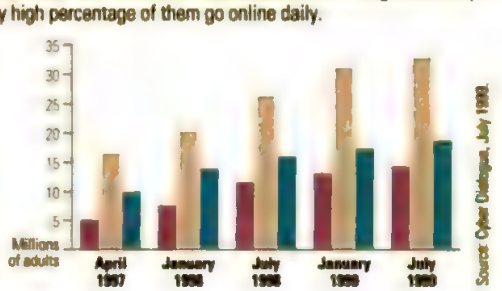
Source: InfoBeeds, a Ziff-Davis Organization, July 1999 U.S. market share.

Hackers Take to the Web

This seems to be the year for high-stakes hackers to unleash their fury by attacking e-mail boxes, hard disks, and even high-profile Web sites. The latest spate of hack attacks came from a group calling itself the United Loan Gunmen. The group recently defaced the home page of the Nasdaq-Amex stock market, publishing a false story on the site called "United Loan Gunmen Take Control of Nasdaq Stock Market." The defacement only stayed in place for minutes before the stock exchange's servers detected and removed it. The group has also claimed responsibility for hacking the ABC News and C-SPAN sites.

Surfin' Seniors

The number of "seniors" online has nearly tripled in three years, from 5 million in 1997 to 14.2 million in 1999. One standout characteristic of surfers age 50 and up: A disproportionately high percentage of them go online daily.



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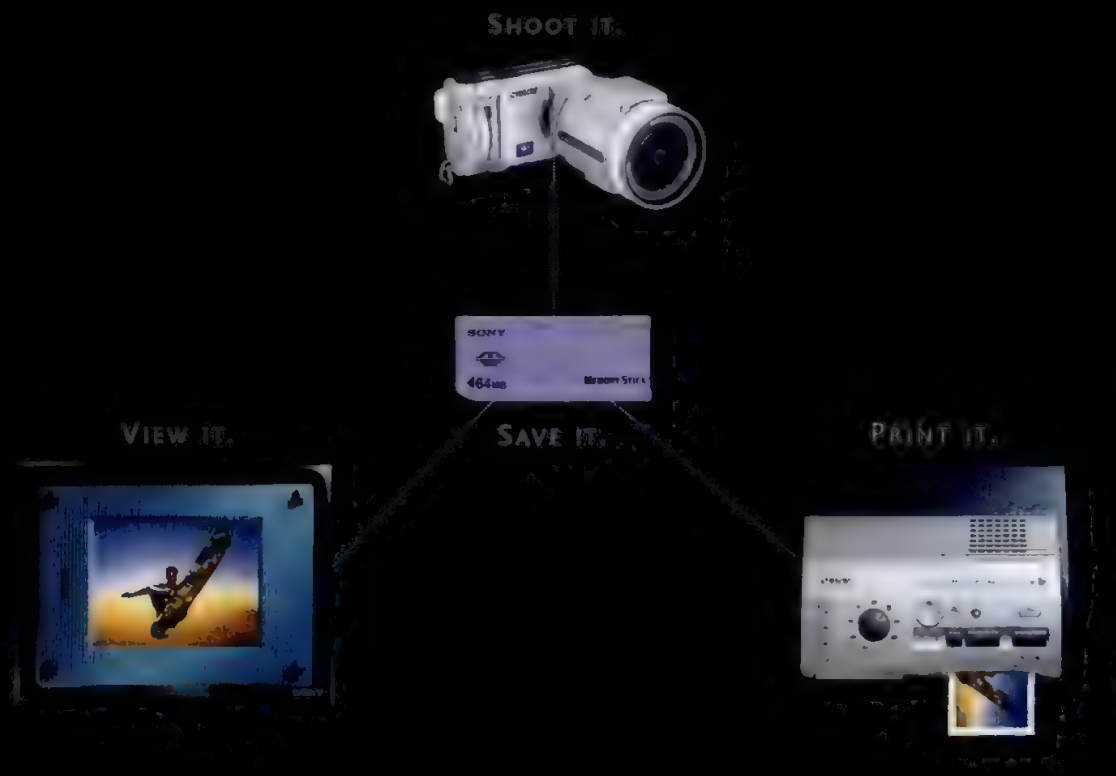

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LETTERS

PORTALS CON BRIO?

Regarding "Web Portals & Search Sites" (October 5), I was surprised to see that you omitted Brio.Portal from the list of corporate portal leaders. We're using Brio.Portal for real-time access to important customer information to speed up decision making and response time. Our nontechnical personnel are more self-sufficient, because everything they are authorized to see is accessible and ready to consume.

Not only does Brio.Portal meet the criteria your article sets out, but it was also the only portal we looked at with the ability to execute dynamically from the back end. Because we serve thousands of users, scalability is crucial, and in our evaluation process, only Brio.Portal was able to meet our needs.

If this isn't corporate portal leadership I don't know what is.

DAVID S. SIMMET
via the Internet

MONEY TALK

After reading "Taking Finances Personally" (First Looks, October 5), I'd like to share my experience with Microsoft Money 2000. I was a satisfied Microsoft Money 95 user except that I needed portfolio management features. I almost crossed over to Quicken when Intuit released its 2000 version. It went back to the store, however, when I found that it couldn't import any version of Money except for Money 99.

So I upgraded to Money 2000 and am regretful. But I will have to live with it, because despite all its faults, Money 2000 provides the additional functionality I need. But what a cost! Instead of using modern programming tools to develop user interfaces of increasing ease of use and speed, Microsoft has turned to the least common denominator of a browser look and feel.

I run a well-equipped 200-MHz Pentium Pro (although not the fastest machine in use, it's certainly not the slowest), and in my experience the program is quite sluggish. Microsoft recommends at least a 75-MHz Pentium. I don't think so.

GREG WHYTE
Boise, Idaho

Your October 5 First Looks article "Taking Finances Personally" was timely: I had ordered Quicken 2000 just a few days before that issue arrived and received the product few days after. I have just finished repacking it to send it back. I found that the program has printing problems and was told that Microsoft Office 2000 causes problems with Quicken's printing support.

Given the size and complexity of products such as Office and Quicken, I can understand how such a thing could happen. Intuit support staffers refused to comment, however, on whether the company intends to do anything about the issue. They told me that the problem was mine to resolve. It is truly outrageous that an end user of products as sophisticated as Office and Quicken would be told to act as liaison between companies as large as Microsoft and Intuit.

> "Brio.Portal meets all of the criteria your article sets out."

W. M. WEST
via the Internet

IN LOVE WITH LINUX

I recently read "Put Linux to Work" in your October 5 issue. I don't agree with the summation that "Linux is mostly restricted to server applications. Software developers, engineers, and designers have found it a good foundation for workstations as well, but true desktop-productivity applications are scarce." The press likes to say that Linux is basically nothing when compared with Windows. Clearly, you haven't done your research on Linux; there are office suites that work with the OS, such as KOffice (which is still in development but looks just like Microsoft Office—and is free).

Linux is a perfect Windows alternative for just about anyone. It's steadily progressing because of those developers who want something that is more stable and more secure. Just about anything you can find for Windows you can find for Linux. The only significant difference is that most Linux products are free. Check out *www.tucows.com* for more information.

RONALD FARNSWORTH
via the Internet

LINUX LETTERS

As a user of Linux, I found John C. Dvorak's October 5 column "The Linux Myth" just slightly off the mark. He has hit the nail on the head about using Linux on low-end PCs, but why aren't there any PCs at my local computer store that come with Linux preinstalled? Until you can walk into a computer store and walk out with a PC with Linux installed, we still have a ways to go. True, there are online companies selling such computers, but the brick-and-mortar outfits (the ones with ads in the Sunday papers) aren't selling them yet.

KENNETH SCHARF
via the Internet

Dvorak made several references to situations where Linux isn't being used (IRC servers, eBay) without mentioning what OS is actually being used in those situations.

In the context of his column it would be easy for the casual reader to assume that anything that isn't running on Linux must be using Windows NT, and this is not necessarily the case. It's apparently true that eBay does use Windows NT, but other sites he mentioned are, in fact, using some flavor of Unix, and not necessarily even on Intel hardware. DALNet, for example, appears to be using FreeBSD, and Undernet uses Solaris (presumably on Sun machines).

Dvorak also implied that Linux is unsuitable for large operations, but I'm aware of some presumably "top-of-the-food-chain" sites that are making use of it (for example, Deja.com and Slashdot.org).

STEPHEN POSEY
via the Internet

What a pleasure it was to read Dvorak's column and finally hear someone say that Linux indeed has some faults. Every time I see the name Linux in print, someone is praising how great the OS is and saying how Microsoft should be worried. The religious fervor of the Linux crowd needs to be taken to task by someone, and I think the column did just that. I have personal experience with Linux—and it's a fun system to play with—but when serious work needs to be done, I return to Microsoft Windows. One of the worst experiences you can have with Linux is trying to get help from a group of people who have no vested interest other than hatred of Microsoft. It's about time they were taken down a notch or two. By the way, I have no personal interest in

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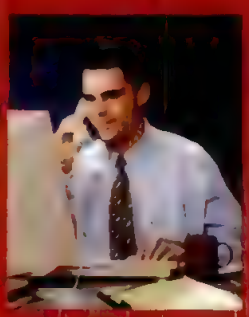

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LETTERS

Microsoft other than the fact that it gets the job done. Thanks for a good read.

HAL BROWN
via the Internet

SWEET SOUNDS

In Bill Machrone's October 5 column, he levels charges, once again, at the music business. One would think that the Big Five are as dreaded as tobacco, chemical, or oil companies—all because a CD still costs $15.

Have you heard music on a good sound system? MP3 is a compressed format, so it can't provide high-definition sound. "Near-CD sound quality" is a marketing ploy. For those who measure microprocessors up to the nanosecond, why exactly is "near-CD quality" acceptable? Nobody who can appreciate music on decent equipment can say that a downloaded song from the Internet sounds like a CD. MP3 and downloadable music are not for serious listeners or for the millions of people without computers. Yes, music companies behave badly. And so do software companies. Have you heard about a little outfit called Microsoft?

ALBERTO AREBALOS
via the Internet

IN THE OFFICE

I was dismayed to read your Second Looks assessment of Microsoft Office 2000 (October 5) claiming that the only people who would gain from using it are those who share programs across the Web. I've found that Office 2000 apps start up much faster than the 97 versions. They're the closest I've seen to *instant on* in major apps. This is even more evident in Outlook, which I found to be quite slow in the past, especially when it's shutting down. This improvement and the better interface prompted me to dump Outlook Express for Outlook.

Another complaint you had was that Word and Excel open documents in separate windows. I was pleasantly surprised to see this feature. I'm no beginner, but I have found switching between documents easy.

MIKE PULSIFER
via the Internet

THE LATEST WORD

Thank you for helping me resolve my biggest peeves with Word 2000 (Solutions, October 5). Every item mentioned in the article was a problem I've experienced. I have found Word 2000 so overwhelming that I was seriously considering dumping it and going back to a previous version. Your article probably saved Bill Gates from having another very unhappy user.

JAMES A. MCKANE
Kitchener, Ontario

IM WARS

Instant messaging (First Looks, September 21) is a great new tool that shouldn't be hamstrung by proprietary systems. Can you imagine what the computer world would be like if e-mail were like that? I love the idea of being able to chat with friends and relatives, but I don't think it's fair that I have to load instant messengers from AOL, Microsoft, Prodigy, and Yahoo! just to list everyone I'd like to hear from. The executives at these companies need to stop being so childish about something that is already available to the entire world. Instead, they should all try to be the first to integrate, not just innovate. Kudos to Microsoft and Prodigy for their attempts.

MATT KILMAN
Sharon Hill, Pennsylvania

BARKING UP THE WRONG TREE

In the October 5 Letters, John Gruener made some good points about John C. Dvorak's recommendation of DiskJockey 98 (Inside Track, July). In his online response, Mr. Gruener went on to correct what Dvorak had said on the subject of XTree and ZTree functionality. I think the information could help users in search of a 32-bit replacement for XTree.

Dvorak states in his column that "the functionality of DOS-based XTree and ZTree has never quite been duplicated in Windows." As Mr. Gruener put it so well, "ZTreeWin is a very capable, up-to-date file manager and, contrary to Dvorak's statement, is not a DOS-based program. It's a full Windows 32-bit program, which won't run under DOS. Therefore, again contrary to Dvorak's statement, XTree functionality has been duplicated, and far surpassed, in Windows."

GREG AKERS
via the Internet

JUST KEEP MY MILK COLD

I read John C. Dvorak's September 21 Inside Track and would like to suggest why a refrigerator that lasts 15 years might come with a component like a computer screen, which will be obsolete in two: because Maytag loves Dell's business model and can't wait to sell new refrigerators to me every two years.

JEFF BOUCHER
George Town, Cayman Islands

SECURITY ISSUES

I was grateful for "The Right Speed For You" (September 1), but I noticed there was one key thing you didn't mention in the article: the processor serial number (PSN) that is in every Intel Pentium III chip. I'm sure that many of your readers are, like me, very concerned that their privacy may be compromised because of the PSN.

MATT JOHNSON
via the Internet

IT'S A DATABASE

In "SQL Database Servers" (August), you reduced the contenders to Microsoft SQL Server 7.0 and Oracle8i. I would have preferred to see those two packages compared with current shipping versions of the other databases and some hints about upcoming versions. Your reviews were mostly from the user and administrator points of view, but these databases are not used as simple data containers. To take full advantage of the products' power, some tasks have to be programmed at the database level instead of the application level. As a database application developer, I love the SQL Server administrative tools, but I hate the lack of programming features.

LUIGI D. SANDON
via the Internet

Corrections and Amplifications

In our story "Connect Anywhere" (August), we incorrectly stated the system weight of the Apple PowerBook in the review and in the Scorecard. The system itself weighs 5.9 pounds, 7.1 pounds with the AC adapter.

In our story "Are You Safe Online?" (September 1), we incorrectly stated that Navaho Lock supports key lengths up to 128 bits. It supports up to 168-bit key lengths. It also supports MD2 and MD5 for both sending and receiving.

The illustrations for our story "The Web You Want" (October 5) were done by David Goldin.

In our story "19-Inch Monitors: The Big Picture" (October 19), we gave the wrong phone number for PlusOne Technologies Corp. The correct phone number is 888-707-6888.

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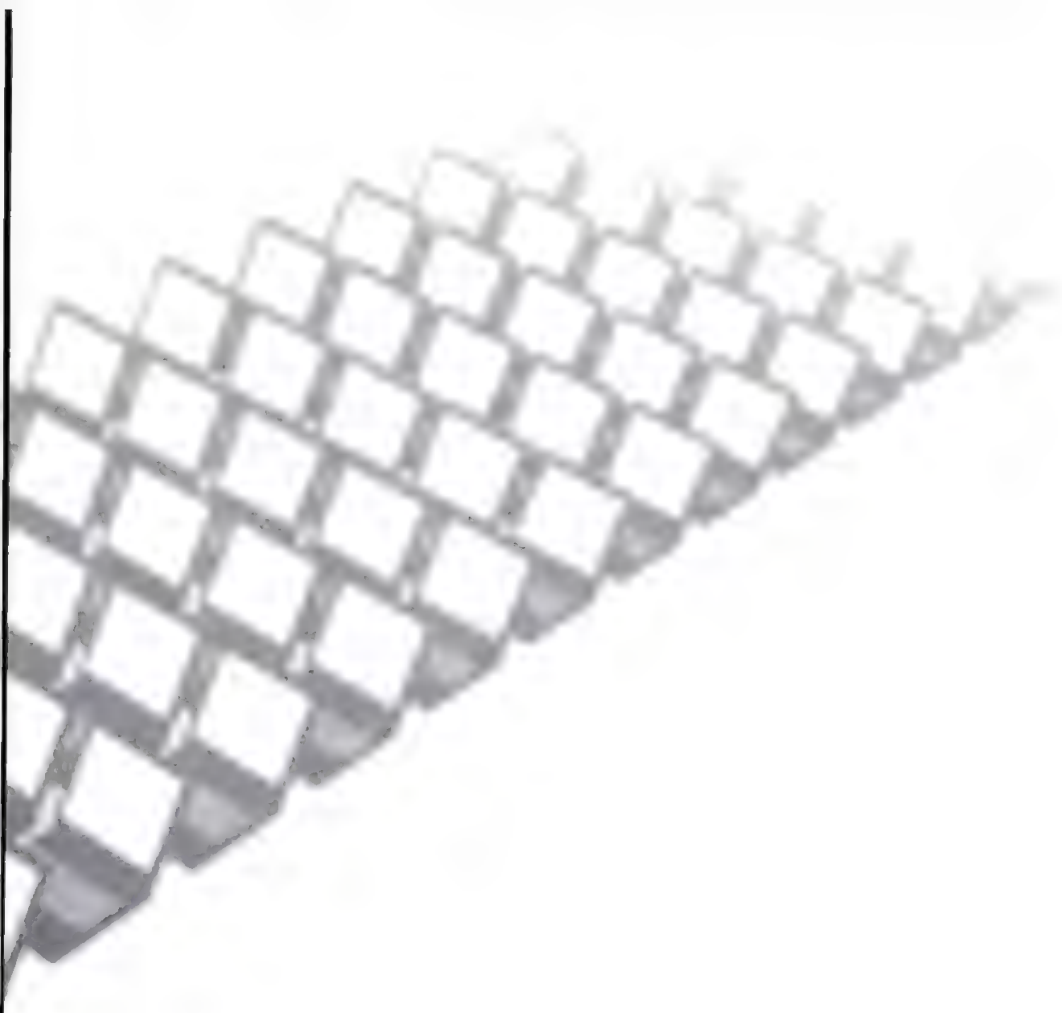

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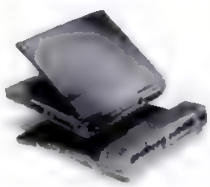

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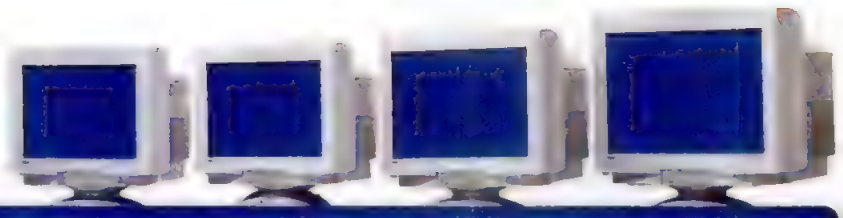


NEC Technologies

The E-Biz Boom

Will e-commerce for business eclipse e-commerce for consumers?

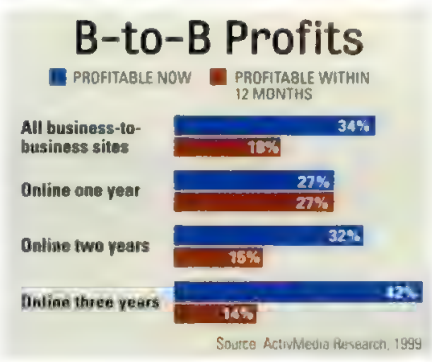
Business-to-business e-commerce has become a profitable niche. Whether the products in question are supplies or rentable software applications, businesses are buying and selling from each other online. According to analysts at ActivMedia Research, over 42 percent of business-to-business Web sites that have been online three years or more say they are currently profitable, and 27 percent of business-to-business sites that have been online for less than a year say they are seeing profits. "We expect that e-commerce between businesses will far surpass that of consumer-oriented sites," says ActivMedia vice president Anne Wheeler.

From the widespread effort to equip application service providers (ASPs) with the tools they need to provide business apps on the Web to the effort to overhaul the Web's organization with XML (eXtensible Markup Language), business-to-business software tools and services are squarely in the sights of leading technology companies.

Recently, Microsoft announced it will provide new tools, servers, and services for the Web and Windows 2000 to speed construction of e-commerce applications, including business-to-business applications. Following the release of Windows 2000, which is expected later this year, Microsoft will update a series of products within its Distributed Internet Application group.

Visual Studio 7.0, a new App Center Server, and BizTalk XML Server are all included in the group. Microsoft CEO Bill Gates has been vocal about the XML data transfer and organization standard as the critical "common language" that business applications must speak, and XML will be common to all of Microsoft's Distributed Internet Application efforts. BizTalk Server, for example, will help application servers and legacy systems talk to Web-based business applications.

Companies such as Oracle—and now Microsoft itself—are also focusing on supporting ASPs, which are shifting the software model away from shrink wrap and toward online applications you can rent. This shift has major implications for business-to-business commerce.



Market researchers at the Yankee Group foresee applications-hosting services growing to an $11 billion business by 2002, up from $3.1 billion in 1999, which could make rented online applications one of the big drivers of business-to-business commerce.

The rapid and successful boom of business-to-business ventures on the Web and the growing volume of applications hosted online may lead to a new breed of vertical portal sites. For example, Stephen Watt, CEO of Invisic, has offered enterprise "e-service" and management applications on the Web for some time—mostly aiming to perform tasks that are common to professional groups like consultants, accountants, and lawyers.

Using Invisic's Web-centric applications, a consultant in any kind of business can, for instance, record travel and expenses on the Web and access the information from home or office later. Watt says he envisions a Web full of vertical portal sites loaded with these types of online applications and targeted directly at professionals in specific fields. For example, a lawyer might record billable hours on the road via a vertical portal site with a legal focus.

Says Watt, "Ultimately, we believe a large number of professional services firms will be interested in Web-hosted, self-service applications and vertical portals."—*Sebastian Rupley*

ILLUSTRATION BY IDIT MATAN

More Trends Online • Do you know your digital identity? • Why open-source software will prevail • Web content to go • Web sites for freelancers • Plus: Expanded versions of the stories in this section www.pcmag.com/trends

Can MSN Stage a Comeback?

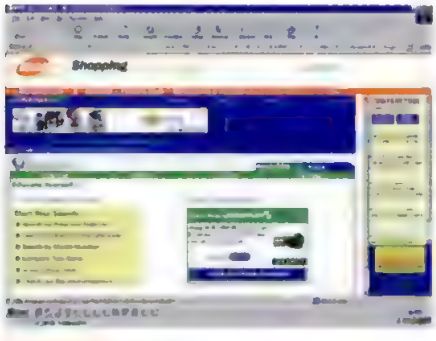
In November, Microsoft plans to debut a completely overhauled version of MSN, featuring new search, shopping, and communications capabilities, new partnerships, and more. The company is also raising the monthly MSN charge for new users by $2 to $21.95.

Those were the headlines at a recent event where Microsoft senior vice president Brad Chase, vice president Richard Belluzzo, and president Steve Ballmer detailed the company's plans to improve MSN's standings.

The company's efforts in overhauling MSN will focus on several areas: delivering a richer set of software and services for common Web activities, offering *megaservices* to Web site developers, building marketplace partnerships to improve shopping experiences, and delivering the Internet to users anytime on any platform.

In the area of providing megaservices to Web site developers and building marketplace partnerships, Microsoft is seeking to link MSN services to commerce offerings. As MSN finds new partners, MSN-centric services, such as cobranded MSN instant messaging and Microsoft Passport, will be extended to the partner sites. Microsoft's Chase described the effort as "integrating MSN with online marketplaces." Chase also announced a new vertical portal service for small businesses called Microsoft bCentral.

Microsoft is planning to integrate its non-MSN software tools with MSN and to focus on commerce and e-services to help MSN grow. It's going to be an uphill climb, though. MSN, with just over 2 million subscribers, ranks well behind America Online, which boasts more than 18 million subscribers. MSN also trails AOL and Yahoo! in the Web portal race, according to market research firm Media Metrix.—*Sebastian Rupley*



PENNY-WISE: *MSN's shopping features include several ways to compare the same product from different vendors.*

INSIDE PC LABS

Who's Counting Pixels?

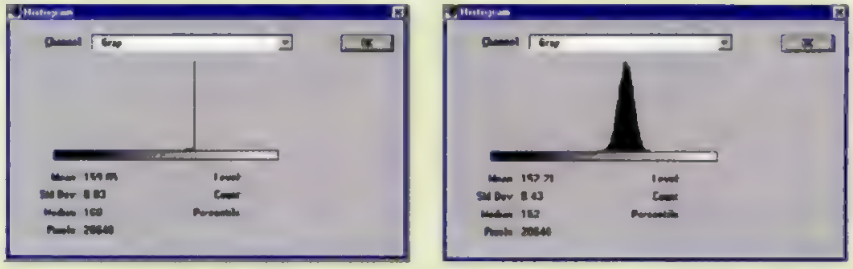
Not all *megapixel* cameras are alike, as PC Magazine Labs discovered while testing digital cameras for this issue's feature story on the subject. In some cases, there's a night-and-day difference between two cameras producing the same number of pixels. That's because the number of output pixels is less important than the quality of the lens and the CCD (charge-coupled device) array.

To get a better picture of the lens and CCD array quality in the cameras we evaluated, we put them through three rigorous tests we created for image sharpness, noise-level measurement, and framing accuracy.

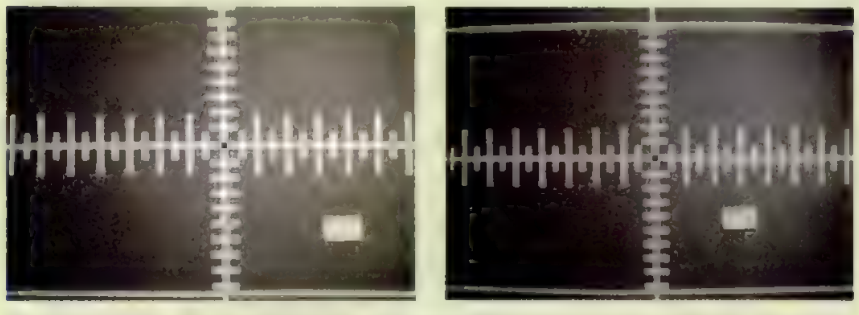
Because a digital camera is inherently an optical device, a photo is only as good as what the lens can resolve. The lens focuses light onto the photosensitive CCD array, which consists of transistors that generate electric current according to the intensity of the light. The sensitivity of the CCD and the precision of its signals affect the clarity. The number of transistors forming the CCD array can also affect the quality. Each megapixel-class camera we evaluated has at least 1 million transistors; some models labeled *megapixel* have fewer. These latter models interpolate up to a million pixels to produce the output image.

To differentiate the megapixel cameras, we recommend that you consult the image-quality analysis in the online supplement to the digital camera story at *www.pcmag.com/digitalcameras99*. We also urge that you consider what our jurors saw with their own eyes. Their findings are reported in this issue.—*S. Jae Yang and Glenn Menin*

For a test target, we used a box with a black interior and a square hole covered with a sheet of fine-edge white paper slanted at a 10 percent grade. The point-spread function of the lens, which correlates with the resolving power, dictates the width of the transition pixels. Better cameras have fewer transition pixels (left). A greater number of transition pixels (right) indicates poorer resolution.



We shot a uniform gray target and measured the gray-level variation in the captured image. A narrow histogram (left) indicates little variation in the gray level. A wider histogram (right) indicates higher noise level caused by the imperfection of the lens and the analog-to-digital conversion process.

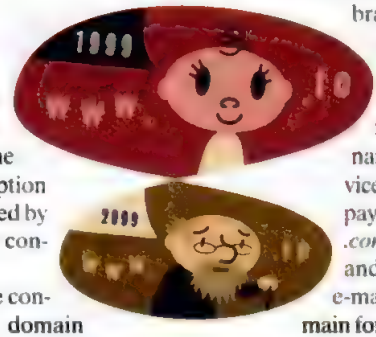


Some cameras capture images that are almost exactly what you see in the viewfinder (left). Others capture images that are very different than what you see in your viewfinder. Some capture a much wider angle or cut off your subject's head. Yet others warp the image, creating a fish-eye effect (right).

PHOTOGRAPHY BY THOM O'CONNOR (TOP)

INTERNET

Domain Name Democracy?



Want to register a Web domain name? Now you have more ways to go about it. The accreditation of more than 70 registrar companies by the Internet Corporation for Assigned Names and Numbers (ICANN) has challenged the dominance of Network Solutions Inc. (NSI). And recently, U.S. Commerce Secretary William M. Daley announced a tentative agreement among the Department of Commerce, NSI, and ICANN to let all interested players participate in the name game.

The resolution brings to an end NSI's refusal to recognize ICANN's authority over the shared domain name registry. NSI will now provide equal access to the registry for all ICANN-accredited registrars. Fees will be lowered, and the period of registration will also be adjusted. "The important thing is that this has been done through agreement rather than litigation, avoiding the significant economic disruption that would have been caused by continued instability and controversy," says Daley.

These organizations are concerned with registering domain names ending in *.com*, *.net*, and *.org*, but Tonic Corp. is taking a different tack. In partnership with the island nation of Tonga, the company manages the *.to* Tongan domain names. A major concern of those who register domain names is the fear of losing them through the biannual fee process. Tonic offers extended leases from 1 to 100 years on the *.to* domain name of your choice. A one-year registration in the *.to* domain costs $50, rising incrementally to $2,500 for 100 years. Tonic also offers an e-mail name service that lets you brand your e-mail accounts to your specific domain.

iDirections.com is taking another approach with its NAMEzero domain name and personal portal service. The company is offering to pay the registration fee for your *.com*, *.net*, or *.org* domain name and provide the portal and e-mail services related to the domain for free. "If you already have a free e-mail account or free Web page, you can immediately integrate it into your domain," says Bruce Keiser, cofounder and president of iDirections.com.

Your personal portal will have a toolbar along the bottom of the screen, with buttons for software applications, online shopping, e-mail, and instant messaging, as well as a small advertisement space. The full service is expected to go live by late November.—*Sharon Nash*

Have Computer, Will Travel, Won't Get Lost

Jake Kirchner

The best thing about participating in the personal computing revolution is watching the births of new, productive ways to use digital technology. From the invention of the electronic spreadsheet two decades ago to today's flowering of the Web, we've seen dozens of new applications of computing power to everyday life. Think of CD-ROMs, digital photography, and GPS, to name just a few.

Even more exciting is seeing these applications combined into cool products and services that would not have been possible without the underlying digital technologies. One application I've been tinkering with recently that's both useful and fun is digital topographic mapping. This may sound a bit esoteric, but if you spend any time at all in the great outdoors—hiking, camping, fishing, visiting national parks, or even just driving cross-country—you'll find the new maps compelling. They have many applications on the business front as well. For example, governments employ them for land-use planning and search-and-rescue operations. Commercial and residential real estate developers have an obvious need for them as well.

Personally, I like Maptech's new four-CD guide to the Appalachian Trail. If you've ever lived on the East Coast, then you're aware of the Appalachian Trail, which runs almost 2,200 miles from Georgia to Maine through 14 states. More than 2 million people traverse some portion of the trail every year. That's one big market.

The Maptech CDs ($139 list for the entire set, or $39 for each of four regions, *www.maptech.com*) combine U.S. Geological Survey (USGS) topographic maps with a database of information about the trail (local flora and fauna, weather, geology, shelters, campsites, supply points, and so on) and about the physical and commercial sites surrounding it. More than 150 photos show you what you'll find along the trail. You can plan your trek, check distances, see elevations for your particular trip, and load in GPS data. Then you can print out maps to keep you on schedule and on track. In the future, look for similar mapping products from Maptech for boaters and pilots; some of the titles will incorporate digitized satellite imagery. The Appalachian Trail series follows Maptech's similar guides to the 54 U.S. national parks. These are fun and educational, even if you don't require them for recreation or survival.

Just as useful but for more everyday applications are the new 3-D topographic maps from DeLorme (*www.delorme.com*), the leading mapping software publisher. Most computer map users are familiar with DeLorme's Street Atlas. I've been impressed with the company's products, which I've tried along with the DeLorme Earthmate GPS receiver.

DeLorme is releasing its new 3-D maps state by state. The CDs contain DeLorme's standard vector-based maps plus the USGS topographic data. They offer GPS compatibility and a nifty 3-D model of your chosen terrain, giving you a much more realistic view of the area covered.

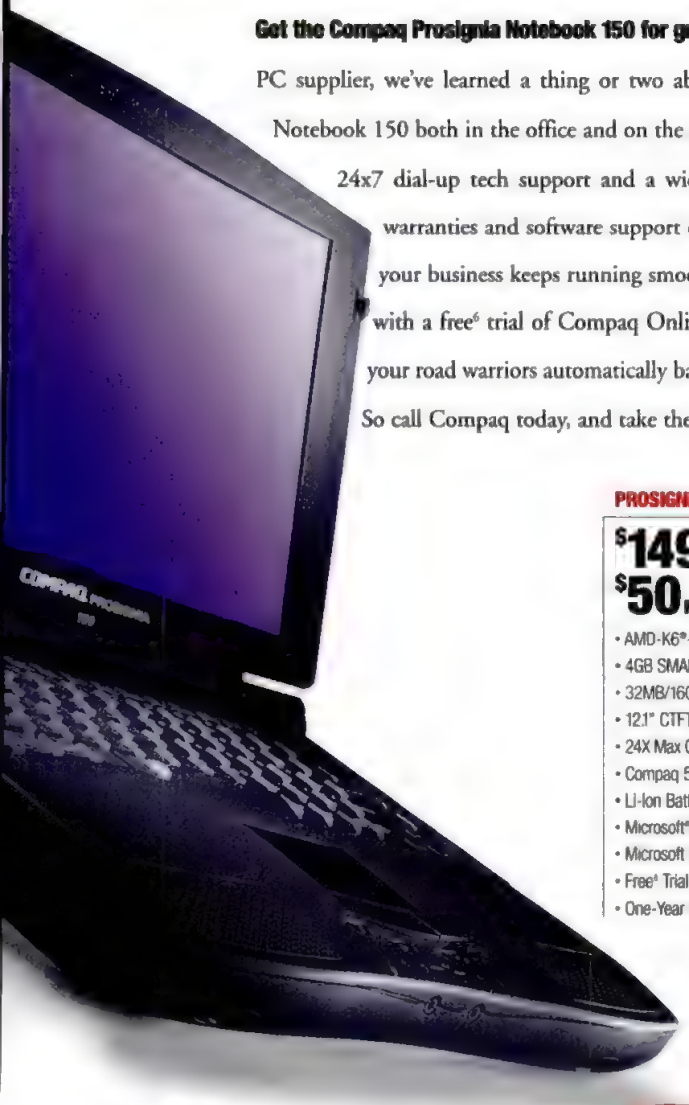
Even more interesting is the capability to download the new 3-D TopoQuad maps to your Palm device. Granted, the hand-held's screen size makes using these maps difficult, but you can scroll around on a map and zoom in easily. In any case, it sure beats having to haul around a laptop on your travels. And in a worst-case scenario, your GPS device, PDA, and cell phone could let you transmit your exact coordinates to rescue services if you happen to get lost.

Compaq Business

August 1999
Windows Magazine
WinList: Best Buy

July 1999
Portable Computing
Lizzie Award

Road warriors, not road worriers.



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RESEARCH

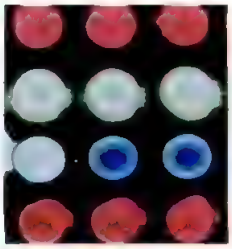
Flash Forward to 2005

Every year, the movers and shakers in the chip industry convene at the International Electron Devices Meeting to share their research and provide important clues about where electronics technology will be three to five years down the road. This year, a blazingly fast chip, a colorized plastic display, and a 6-million-pixel image sensor will take center stage at the gathering.

One of the highlights of this December's meeting in Washington, D.C., will be TRW's 69-GHz transistor, which uses an exotic semiconductor material called indium phosphide instead of silicon. Although the material is expensive and difficult to work with, it produces blazingly fast transistors that could be useful for high-speed optical communications systems.

Researchers from Intel plan to show a 16-megabit memory chip running at 1.06 GHz and using technology that may one day push the clock frequencies of microprocessors beyond 1 GHz. A major problem with operating integrated circuits at such high frequencies is that they use as much power as light bulbs. With this technology, Intel engineers were able to build the device so that it consumes less power.

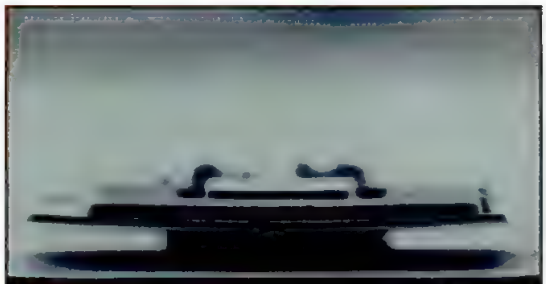
Seiko Epson has come up with an active-matrix flat-panel display built from a type of light-emitting plastic called phenylene vinylene. The researchers have built a 5-cm–diagonal display using an economical ink jet deposition process that essentially prints all of the display components.



LIGHT BRIGHT: *Seiko Epson built a tiny, color, flat-panel display using light-emitting plastic.*

Meanwhile, researchers from Philips Semiconductors plan to present a new CCD (charge-coupled device) image sensor for digital cameras that packs in 6 million pixels. That's 4 million pixels more than high-end digital cameras have today. According to Philips, the resolution of the 6-million-pixel CCD is comparable to that of conventional 35-mm film, a parity that the digital imaging world has long sought.

Rather than presenting new electronic devices per se, several companies plan to present new processes for building them. For example, Toshiba is working with air. It turns out that gaps of air in silicon are excellent insulators, and researchers have figured out how to manipulate silicon atoms to form air pockets of desired shapes and sizes. In a sense, they've figured out how to build nothing.



SPEED RECORD-BREAKER: *TRW used an exotic semiconductor called indium phosphate to build a 69-GHz chip.*

Much of the discussion at the International Electron Devices Meeting will focus on the challenges researchers face in trying to make smaller and smaller transistors. As chip components scale down to atomic dimensions, leakage of current and undesirable electrical phenomena become bigger problems. Although much progress has been made in packing more transistors on a chip while keeping its overall dimensions the same, the industry may be approaching the point where some of these problems become insoluble.—*Carol Levin*

NETWORKING

Low-Cost Network Storage

Downtime and lost productivity are par for the course when it comes to adding storage to a network, but the emergence of network-attached storage appliances is set to simplify such upgrades and make them more affordable. Designed for small businesses or workgroups of 20 to 100 people, a storage appliance wraps all the networking essentials into the hard disk components so it can connect directly to an Ethernet hub, bypassing the complications of upgrading a Windows NT or NetWare server.

The storage appliance is independent of the network server, so users can access data even if the network file server crashes. Where a server upgrade can take days, installation of a storage appliance can take minutes, according to Quantum, a leading maker of hard disks and a player in the infant market for network-attached storage. In addition, since a storage appliance is optimized for one function, it offers fast access to data and high reliability.

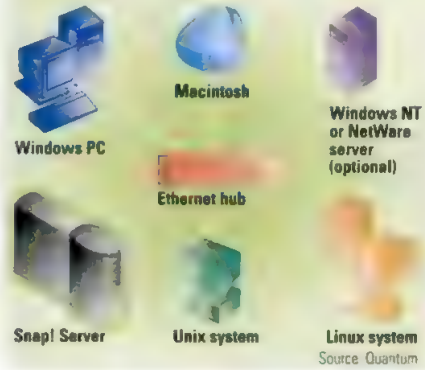
A storage appliance can also be more economical than a server or hard disk upgrade. Although the up-front cost of a Snap! Server ($995 for 20GB) is more than that of a hard disk ($600 for 20GB), Quantum says that customers can realize significant savings in avoiding network downtime. And since the appliances don't carry the baggage of licensing fees, customers pay for a device once and don't have to pay again if the network grows.

Quantum recently acquired Meridian Data, which developed the Snap! Server and the software to go along with it, including the network protocols, file system, real-time operating-system kernel, and I/O drivers. (Unlike a network storage appliance, the similarly named *storage-area network* is designed as the backbone of an enterprise network and puts intelligence on the server.)

Although storage appliances are relatively new on the scene, the entrance of Intel and Bay Networks has further legitimized the growing market. The Intel InBusiness Storage Station offers increased shared file space for small networks and provides an easily managed repository for data backup. Market research firm Dataquest projects that the market for network-attached storage will rise from $160 million in 1998 to almost $4.5 billion in 2003.—*Carol Levin*

Network-Attached Storage

Because a storage appliance such as the Snap! Server connects to the network hub rather than the file server, extra storage is easy to install, offers faster access to data, and is cost-effective.



Source: Quantum

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April 1999. When referring to hard drive capacity, GB stands for one billion bytes. Some utilities may indicate varying hard drive capacities. Total user-accessible capacity may vary depending on operating environments. DVD motion playback is not supported under Windows NT Workstation 4.0. Notebook computer only; webcast 1.44MB diskette and CD-ROM drives and AC adapter.

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pentium III

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Online Investing

By Sebastian Rupley

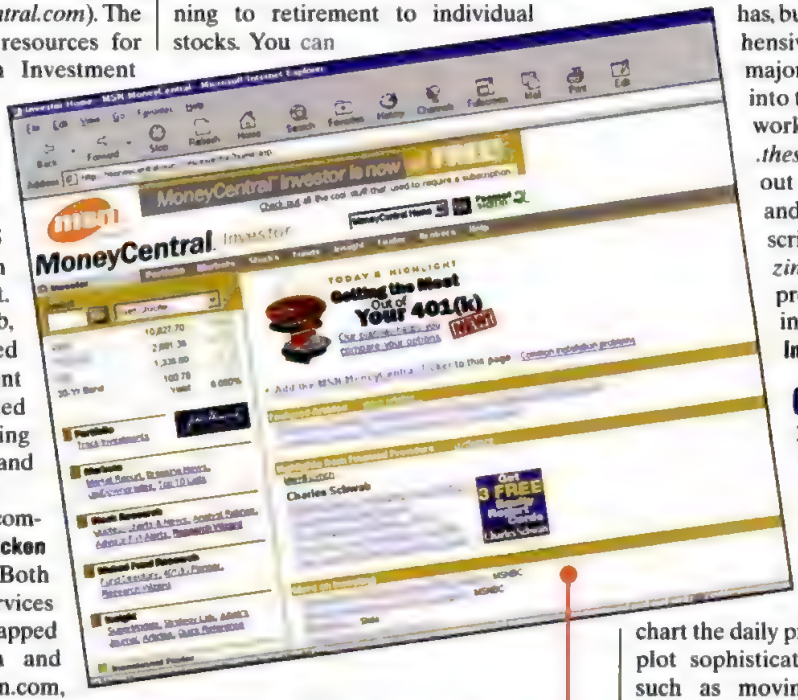
The Web has spawned a revolution in investing and reshaped the world of finance. According to Robert Johnson, chairman and CEO of 200-year-old Bowne & Co., "The rise of the Internet and electronic data delivery has profoundly affected the delivery of all kinds of financial information." Online deep-discount brokerages and a dizzying array of investment sites have spawned a new generation of investors and traders willing to take their investment decisions into their own hands. How to make good decisions? The do-it-yourselfers can get help from many powerful tools offered free on the Web.

Search for Opportunities

For several years, Microsoft operated a site called Investor that combined a few free services with subscription-based services. Now Investor services are free at **MSN MoneyCentral** (*www.moneycentral.com*). The site offers some powerful resources for investors. For example, an Investment Finder application lets you screen a database of stocks and funds for securities that meet specified parameters, such as stocks with price-to-earnings ratios lower than 15 and annual earnings growth rates greater than 25 percent. At the site's Strategy Lab, you'll find regularly updated high-performance investment models. The site is also loaded with useful portfolio-tracking features, tax advice, columns, and interviews with top investors.

MSN's MoneyCentral site competes directly with Intuit's **Quicken.com** (*www.quicken.com*). Both seek to offer useful tie-in services for their respective shrink-wrapped finance products: Quicken and Microsoft Money. At Quicken.com, Quicken users can enter their transactions over the Web and download them directly to the Quicken product on their desktops. Likewise, Intuit's TurboTax users can get up-to-the-minute patches and add-ons at the Quicken.com site. Like MoneyCentral, Quicken.com lets you sort for, say, mutual funds that meet certain criteria. The Quicken.com site also throws in a host of free articles about portfolio tracking.

One of the most popular free financial advice sites is **The Motley Fool** (*www.fool.com*), which has built a reputation for picking model stock portfolios and updating their performances daily. One of The Motley Fool's model portfolios has produced better than 50 percent per-year returns for several years running. The site also abounds with chat forums on topics ranging from tax planning to retirement to individual stocks. You can also find model portfolios of stocks and funds at the **SmartMoney.com** site (*www.smartmoney.com*). The SmartMoney site has been particularly good at selecting model portfolios that consist of several mutual funds. It also archives historical portfolio selections so you can track fund performances.



The free MSN MoneyCentral Investor offers a wide array of resources for investors, including portfolio tracking, a 401(k) planner, and articles on financial subjects.

Know the News

The Web has revolutionized the world of financial newsletters, and there are a few sites that function as clearinghouses for investment bulletins. The **Financial Newsletter Network** (*www.financialnewsletters.net*) features a broad selection. Investors interested in newsletters may want to visit a library and pick up a copy of Mark Hulbert's book *The Hulbert Guide to Financial Newsletters*, which audits the performances of many newsletters.

One of the best free sites for daily market news is **CBS MarketWatch** (*www.marketwatch.com*). At this site, you can tie news delivery into the portfolios you track, and scan hundreds of daily investment headlines. **CNNfn** (*www.cnnfn.com*) doesn't have quite the volume of information that MarketWatch has, but it provides more comprehensive coverage than do most major newspaper sites, and it ties into the Quicken Financial Network. **The Street.com** (*www.thestreet.com*) has also carved out a niche in investment news and columns, though it's a subscription-based site. *PC Magazine's* publisher, Ziff-Davis, provides daily updated investing news at **ZDII Inter@ctive Investor** (*www.zdii.com*).

Chart Your Course

If fundamentals and news aren't your cup of investing tea but charting is, there are some powerful tools on the Web. At **MetaStock Online** (*www.equis.com/java*), investors can chart the daily price action of securities and plot sophisticated technical indicators—such as moving averages—against the charts. At **BigCharts** (*www.bigcharts.com*), you can type in the ticker symbol of a stock or fund, then chart at least ten years of the security's history. The site also features a historical pricing database that can be useful for filling holes in your tax records.

Finally, for a complete, hands-on evaluation of the many discount brokers available online, see the *PC Magazine* issue of March 23, 1999. In that roundup, we opened real-money trading accounts at ten online brokerages and evaluated them based on their commissions and fees, the richness of their sites, their trade-execution speeds, and more. PC

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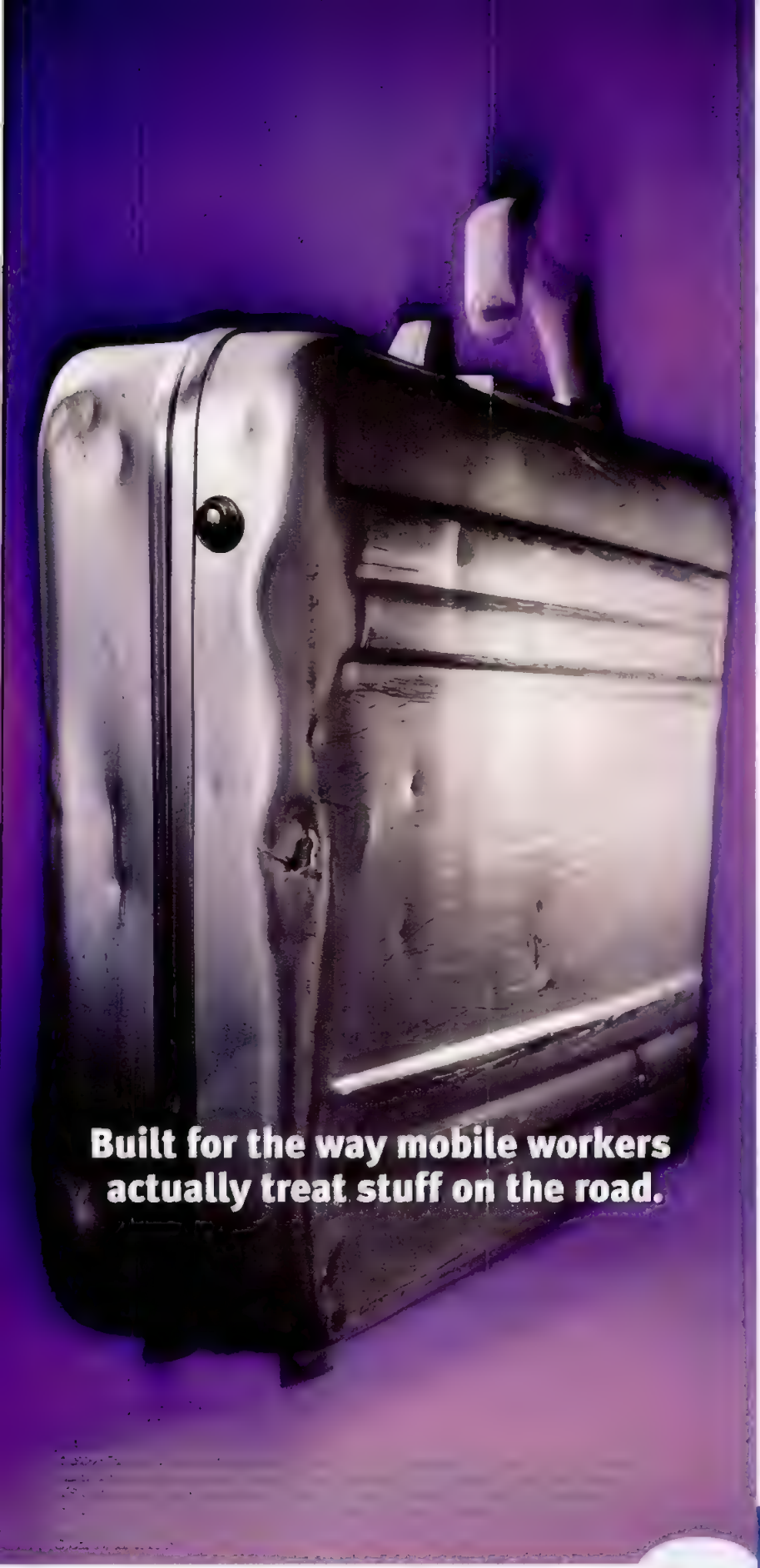

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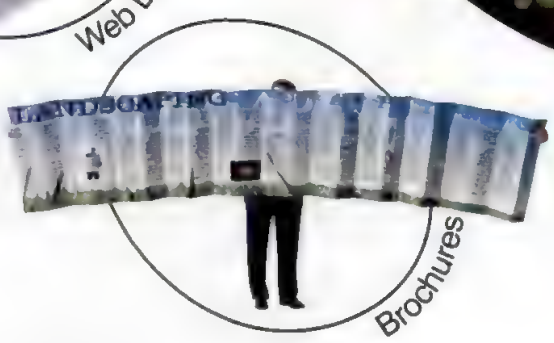

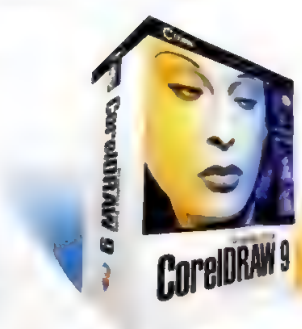

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Virtual Desktop Services

These free Internet services provide desktop applications and keep you in touch with all your data, no matter where you go.

By Neil Randall

With all due respect to the behemoth in Redmond, the question isn't where you want to go today but how you're going to take everything you need with you. Your files as well as your appointment calendar, task list, address book, and e-mail messages are probably on your laptop—but if the laptop is stolen or damaged, or if you just don't want to carry it, you need a way to retrieve everything.

Virtual Desktop Services give you a Web site with the most common PIM applications—e-mail, a calendar, a to-do list, and a contact list—and includes disk storage (from 5MB to 20MB) where you can keep important files. Most of the services offer the kind of integration you expect on your company network.

You can share your appointment calendar, create appointments and tasks from e-mail messages, send files to coworkers, invite people to meetings, and more. And all of this, amazingly, is free. The vendors make money from ads, from premium services, and—potentially—from partnering with ISPs.

Simply go to a service's URL, click on the link for setting up an account, fill in the information fields, and you have an account. You're taken to a start page from which you'll see the applications you can work with. In most cases, you can download additional apps, such as a calendar or e-mail synchronization with PIMs such as Outlook or Palm devices, and you'll also be able to access pay services such as extra disk storage, telephone conferencing, and file viewers.

Each desktop service has its own focus and its own look and feel. Visto's apps and features have a corporate look; MagicalDesk will appeal more to personal users. Zkey.com fits in between the two and adds apps such as a chat area, whereas StoragePoint.Com sacrifices appearance for specific features such as a strong file manager.

In testing, we found all the services significantly slower than local PIM and file management software—because they operate over the Internet. Even with a cable connection, the screens took anywhere from 5 to 30 seconds to redraw. Though that's expected with an online service, it means you won't toss your PIM software immediately.

But for keeping track of the details in your professional and personal lives and having access to those details from any computer with an Internet connection, these services are almost irresistible. In fact, don't tell the service owners, but we'd almost be willing to *pay* for them.

MagicalDesk

What you get free: 5MB file storage space, address book, bookmarks, calendar, e-mail, to-do list.

What you pay for: 250-format file viewer ($5 per month), five additional external POP accounts ($10 per month), extra file storage space ($5 per month for 20MB, $10 per month for 50MB).

First things first: Of the services covered here, MagicalDesk has far and away the best online tour/tutorial of its capabilities. Not only does it show you how

SMALL BUT MIGHTY:
The IBM 340 MB microdrive Travel Kit advances the removable storage field for mobile devices. *Page 53.*

SMART SEARCH:
Type a few words and Actioneer 3.1 Smart Portal takes you straight to the Web page you want. *Page 57.*

SECURE PRINTING:
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ILLUSTRATION BY ELLEN WEINSTEIN

to use the six applications the service offers, it clearly demonstrates how they integrate.

The service is also clean and efficient. The start page, called Desktop, provides links to some of the built-in apps, but an Edit Desktop menu lets you customize it completely, using a screen that includes drop-down lists with the most common search engines and research sites. Although the result can seem quite cluttered, it is also the most purely useful desktop we found among the services. Its appearance is, however, less professional than some of the others.

Integration among the apps—called MagicalDesk Objects—is strong, but they tend not to be as feature-rich as those of Visto and Zkey.com. The address book, for example, contains only four fields for each contact (name, e-mail, phone, and fax). You can share the calendar, but there are no options for this: The sharer sees free and busy time only, without details.

One especially strong characteristic in the calendar and to-do features is the setting of reminders. While adding a calendar entry or to-do item, you can specify whom to remind and when to do so.

MagicalDesk isn't as attractive as the other services, and it lacks a few features, but the service is especially suitable for those just getting started.

MagicalDesk. Magically Inc., Redwood City, CA; 650-363-2489; *www.magicaldesk.com.*

Editors' Choice

- Zkey.com

PC MAGAZINE EDITORS' CHOICE

For this roundup, we looked for a number of important features: lots of well-integrated PIM applications, generous disk storage space for files, configurability, and ease of use. Though most of the services stood out in one area or another, Zkey.com offers these features in full measure, along with great information-sharing capabilities and an interface that works equally well for personal and corporate users; it wins our Editors' Choice. Visto was a close second, though, with its flexible and full-featured Options menu and its ability to synchronize with PIM applications.

StoragePoint.Com

What you get free: 20MB file storage space, address book, calendar, e-mail, to-do list.

What you pay for: Premium monthly service—adds database management and increases file storage space to 50MB ($7.59 per month, $49.95 per year), additional file storage space (from 50MB at $6.95 per month or $39.95 per year to 1GB at $69.95 per month or $199.95 per year—Premium subscribers only)

PICK AND CHOOSE: *You can configure MagicalDesk's desktop to include a variety of search engines, research tools, and application launchers.*

The first thing you'll note about StoragePoint.Com is that it is a service built on Java and JavaScript, and as a result the modules can take several seconds each to load. The next item is that—more than any of the services reviewed here—StoragePoint.Com expects users to have a considerable amount of computer knowledge. The Help system, for instance, is jargon-laced in ways that will glaze many eyes, and the e-mail module offers buttons with terms such as Set, Clear, and Purge Deleted that are reminiscent of older interfaces.

Even the instruction "Type the complete path name for IE favorites" is geek talk these days. Several of the screens also reflect this geeky feel, with appearances bordering on the amateurish and interfaces bordering on the unusable. The e-mail module's Compose screen is a striking example of the former, and its message-viewing screen an example of the latter.

But does it work? Yes. The WebDrive module is a richly featured file-storage system, letting you see the entire contents of your local drives in order to select items to upload. The Contacts feature gives you a complete set of fields to capture information. And the Calendar screen provides a useful reminder feature.

Still, there's not a great deal to recommend about StoragePoint.Com. It's quite slow, its interface is largely unintuitive, and it lacks even common PIM features such as the ability to make a calendar entry directly from an e-mail message. If you use StoragePoint.Com, use it as a place to store files, not as a PIM.

StoragePoint.Com. StoragePoint.com, San Diego; 858-676-3900; *www.storagepoint.com.*

CASE IN POINT: *This screen demonstrates the kind technical detail you encounter when using StoragePoint.Com.*

Visto

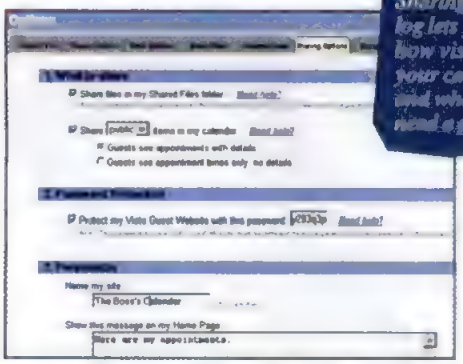
What you get free: 15MB file storage space, address book, bookmarks, calendar, e-mail, groups, sharing, task list.

What you can download or access free: Synchronization for ACT, Lotus Organizer, Palm, Outlook; HP Instant Delivery for printing schedules.

What you pay for: telephone information retrieval ($4.95 per month for 60 hours), 250-format file viewer ($5 per month), five additional external POP accounts ($10 per month), additional file storage space ($5 per month for 20MB, $10 per month for 50MB).

Signing up with Visto is quick and easy, and as soon as you have a start page (My Visto), you're presented with scads of information. New features, including third-party offerings, are being added regularly, and they are prominently displayed when you log on. You're told how many appointments, messages, and overdue tasks you have, and you get a list of your active groups. Actually, the start page would be more useful if it gave you an idea of what the appointments and tasks actually were, but Visto's idea is not to let prying eyes see any details at all.

The most important part of



FAIR SHARE: *Visto's Sharing options dialog lets you determine how visitors will see your calendar items and whether they'll need a password.*

the Start page is the interface to the rest of the site. Along the left side are the typical icons that move you into the e-mail, calendar, tasks, and other modules. But the tabs along the top of this page—Overview, Import/Sync, Phone/PDA, and Share—act as links to advanced features and to ads.

Currently, clicking on the Phone/PDA tab lets you download software for synchronizing your Visto calendar with your PalmPilot calendar, but it also offers links to Vogo, a service that reads your calendar to you over the phone, and AT&T Click2Dial, a conferencing service (also available on Zkey .com). Full synchronization can also be made with Microsoft Outlook.

From the Options menu you can determine how you want Visto to handle external POP mail accounts (up to two) as well as Visto's e-mail module. Included is the ability to specify a non-Visto reply-to e-mail address, so that if you send a message from Visto, its reply will be to a more frequently used e-mail address.

One of Visto's best features in the Options menu is the Share options dialog, which lets you set exactly what others will see if you share your calendar. Your guests can see all the calendar details or only the appointments marked Public (the calendar modules lets you set appointments as Private). Guests see your calendar through a separate guest Web site, and you can password-protect this site for even greater privacy.

Visto works well and is full-featured enough for most users. Its Start page should be made more configurable, but the calendar, task, and e-mail modules are all strong.

Visto. Visto Corp., Mountain View, CA; 650-930-5000; *www .visto.com.*

Zkey.com

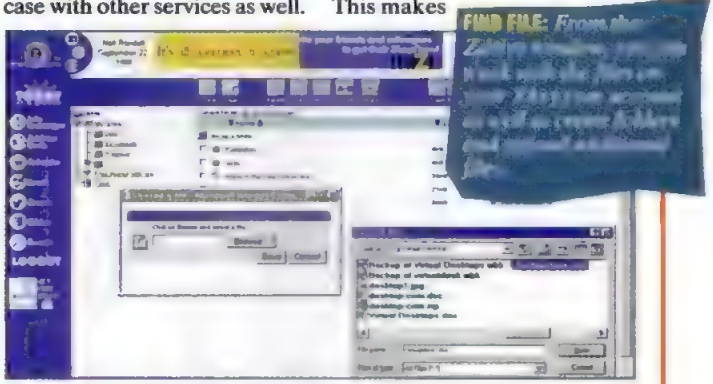
What you get free: 20MB file storage space, address book, calendar, discussion board, e-mail, groups, sharing, to-do list.

What you pay for: phone conferencing.

PC MAGAZINE EDITORS' CHOICE

Once you've signed up with Zkey.com, you're presented with a highly useful if somewhat busy page, Today at a Glance. From here, you can search your address book, see a summary of your calendar, get the weather and stock quotes, and more. This full complement of apps along with ease of use and a flexible interface earn Zkey.com our Editors' Choice.

Once inside, you'll discover that the e-mail module is perfectly functional at composing messages, attaching files, and retrieving mail from your remote accounts. You can't auto-forward your mail, but that's the case with other services as well.



FIND FILE: *From the Zkey.com Zdrive, you can upload files and folders from your PC.*

Zkey.com's calendar is full-featured, offering a daily, weekly, and monthly glance at upcoming items. You can share your calendar with contacts, granting them either Limited Read (they see the busy times, but not the item info), Full Read (they see it all), or Full Read and Write (they can add to your calendar). Unfortunately, there's no way to tag appointments as private, as Visto does.

Zkey.com is especially strong in providing easy information transfer to people you select. The Info Exchanger lists 12 types of information you can provide about yourself, ranging from name and phone numbers to gift preferences and favorite Web sites. The user concept is well thought out, with a variety of locations for e-mailing users, setting up meetings, and even establishing conference calls through AT&T's Click2Dial Conferencing (15 cents a minute per person).

Your contact list can contain Zkey.com users as well as outside users, and you can create groups for specific purposes and assign users to one or more of those groups. You can also invite contacts into a private conference area (chat room) with the Zroom feature and record a transcript of the conference.

The Zdrive feature offers storage space for files that you can upload from your PC into user-created folders and subfolders. Unfortunately, you can upload only one at a time, and you can't upload entire folders. This makes uploading overly time-consuming.

Zkey.com is smart and intuitive, and its help system, easily accessible and context-sensitive, is second to none.

Zkey.com. SDN Online Inc., Los Angeles; 213-408-4200; *www .Zkey.com.* PC

Desktop.com

The goal of Desktop.com, launched as a public beta at the time of this writing, is to offer an alternative desktop to Microsoft Windows, Macintosh, or any other JavaScript-capable OS, with applications developed with its own API. The service differs from the other services reviewed here in that it consists of JavaScript apps, which tend to load slowly. The benefit of this method is that the individual components are full applets complete with drop-down menu bars.

You get bookmarks and a to-do list for free. Address book, e-mail, and calendar services aren't a part of Desktop.com; instead, you must use an outside service, which denies users a feeling of a total information space. You can, however, add your own Web sites to the desktop as clickable icons and upload files to your site and share them with other Desktop.com users.

With a flexible applications manager and a growing list of new apps being developed for it, Desktop.com fits into the virtual desktop category more than any other service covered here. For now, though, check out the speed of the shipping version before you commit.

Desktop.com. San Francisco; 415-701-0200; *www.desktop.com.*

An Entertaining Organizer

The Jornada 430se serves equally well as a PIM device and a mobile entertainment center.

By Bruce and Marge Brown

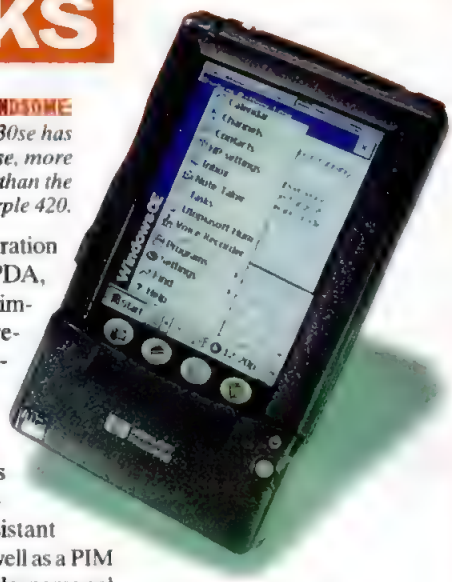
Hewlett-Packard has upped the ante for multimedia PDAs with the stunning new HP Jornada 430se ($500 street). Replete with major and minor improvements, the 430se is likely to share top honors with the current standout in multimedia Windows CE palm-size PDAs, the Casio Cassiopeia E-100.

Compared with the Jornada 420, the 430se has a faster CPU (at 133 MHz), a 64K color display (the 420 showed 256 colors), and stereo audio output via a headphone jack. Bundled software includes a digital-image viewer, MP3 player, and audio book player, as well as the full desktop version of Microsoft Outlook 2000. The 430se measures 5.1 by 3.1 by 0.9 inches (HWD) and weighs a bit less (8.8 ounces, with battery) than the 420.

A clear display cover flips back to allow input on the 430se's touch screen via the standard CIC Jot character recognizer or a tiny virtual keyboard. When the cover is closed, you can still read the screen but won't accidentally push the launch buttons and drain the battery. The 430se's STN display is fine for inside use, but in bright sunlight the screen is useless.

The boost in the speed of the 430se's Hitachi SH-3 CPU to 133 MHz (from 100 MHz) with no decrease in rated battery life (6 hours) is an admirable improvement. The organizer has 16MB of RAM, 8MB of ROM, and a Type II CompactFlash (CF) slot, which will probably be used for optional CF memory cards to store MP3, audio book, and image files.

The 430se is packaged with an AC adapter and a serial travel cable for easy synchronization. The 5-foot serial travel cable has a standard 9-pin serial connector on one end and a dongle on the other end with a jack that fits into the bottom connector on the PDA. The collapsible docking cradle included with the earlier model is now a $30 (street) option. Other optional accessories include an external keyboard ($80), a synch cable ($15), an AC adapter ($35), and a serial printing adapter ($20).



DARK AND HANDSOME *The HP Jornada 430se has a dark gray case, more corporate than the dark purple 420.*

As a second-generation color palm-size PDA, the 430se is a vast improvement on the respectable but uninspiring 420. Along with the Cassiopeia E-100, the HP Jornada 430se is an admirable one-handed digital assistant that serves equally well as a PIM device and a mobile personal entertainment center—but the HP Jornada 430se has the edge because of its smaller size and ease of use.

HP Jornada 430se. Street price: $500. Hewlett-Packard Co., Palo Alto, CA; 800-443-1254; *www.hp.com/jornada.*

An Aero-Dynamic PDA

The slimline, palm-size Windows CE Compaq Aero 1530 challenges the 3Com Palm V.

By Bruce Brown

Targeted at the same mobile professional market as the 3Com Palm V is the new Compaq Aero 1530 Windows CE palm-size PDA ($300 street). If you don't want to carry a thick PDA but still want the extra features and functions offered by Windows CE, the Aero is a noteworthy option.

The Aero is 5.1 inches high, 3.1 inches wide, and 0.5 inches thick, compared with the Palm V's 4.5 by 3.1 by 0.45 inches. Compaq rates the Aero at 4.98 ounces with battery, but it actually weighed 5.4 ounces on our digital scale. The Palm V tipped our scale at 4.4 ounces—smaller and lighter than the Aero, but not by much.

Powered by a 70-MHz NEC MIPS R4000 processor, the Aero has 16MB of mask ROM and 16MB of RAM. The 16-shade, 2.3- by 3.2-inch (WH) monochrome screen uses semitransmissive STN LCD technology; that means it looks better than most PDA screens outside, and the backlit screen is effective in the dark. In room lighting, though, the Aero's just another monochrome PDA.

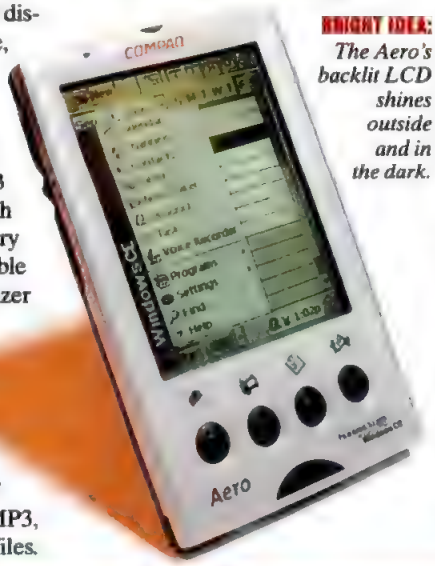
The Aero's 240-by-320 resolution means more content and finer images than you get with the Palm V's 160-by-160 resolution. One complaint about the display is that it has no hardware contrast control; you have to use software for this.

Unlike the Palm V, the Aero has a standard voice recorder, and its 3.5-mm dual-mode jack supports both a microphone and headset. The Aero is fine for business audio applications; it can run Windows CE MP3 software, but the monophonic audio output diminishes its music-listening appeal.

The Aero has a CompactFlash Type I slot, so it can use CF memory cards and modems. The included rechargeable lithium ion battery, rated for up to 14 hours (if you don't use the backlight), charges in 3 hours. Also included are a serial travel cable, for synchronizing without the docking station, and a 12-volt automobile power adapter. As options, you can get a 56K CF modem ($160 street), extra batteries ($41 each), an extra docking cradle ($36), and an extra AC adapter ($28).

The Aero is more powerful than the Palm V but has the same appealing slimness. If you want more features and expandability, the Compaq Aero 1530 may be your PDA.

Compaq Aero 1530. Street price: $300. Compaq Computer Corp., Houston; 800-345-1518; *www.compaq.com.*



BRIGHT IDEA: *The Aero's backlit LCD shines outside and in the dark.*

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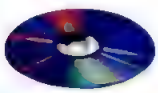

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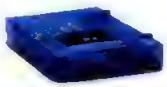

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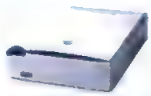

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Prepress Assistance

With Adobe PressReady, designers no longer have to outsource expensive color comps.

By Luisa Simone

As a boon for designers, Adobe has released Adobe PressReady ($250 street)—a printing utility that gives low-cost ink jet printers the power to produce amazingly accurate color comps (facsimiles of projects that are shown to clients for approval before production). In addition to a host-based Adobe PostScript 3 interpreter, PressReady includes color management technology (specifically, support of ICC profiles) and optimized error diffusion algorithms that accurately simulate the look of four-color offset printing.

PressReady also eliminates the associated costs of removable media cartridges, courier fees, and the downtime caused by waiting for the comp to arrive from the service bureau. But most important, the program introduces accurate color printouts early in the approval cycle, creating more realistic expectations on the part of the client.

PressReady works by replacing the ink jet printer's native driver, so you access it from within the print dialog box of almost any graphics application, such as QuarkXpress, Adobe InDesign, Illustrator, and even Acrobat Reader. The exception is Adobe PageMaker, which employs a proprietary Print dialog box that overrides the PressReady interface.

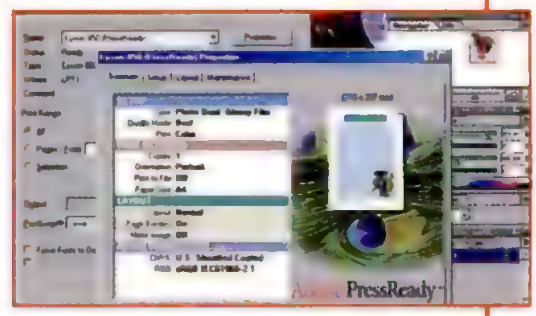
On our tests, PressReady simulated the colors and saturation of an industry-standard match print on an Epson 850. To print, you're required only to choose a quality level and a device profile.

PressReady's PostScript 3 interpreter correctly printed a complex clipping path that the native Epson driver could not handle. But compared with the native driver, PressReady slows down a print job by 15 to 20 percent.

PressReady output should be used as comps rather than as proofs, because the program does not generate a rosette halftone pattern or show potential trapping problems. And the program currently supports only a limited number of printers. Luckily, purchasing PressReady entitles you to download printer updates from the Adobe Web site for 18 months.

We were impressed with PressReady's attention to workflow issues. As an alternative to printing directly to an ink jet, PressReady lets you generate a color-managed Acrobat 4.0 PDF file. A bundled utility, Adobe Circulate Printer Edition, lets you archive, view, and even e-mail the PDFs to either a client or service bureau.

GET READY: *Configuring PressReady is as easy as opening the printer Properties dialog box and selecting paper type and device profile.*



Hassle-free color management, a host-based PostScript 3 interpreter, as well as direct PDF output combine to make Adobe PressReady an indispensable prepress utility.

Adobe PressReady. Street price: $250; through December 1999, $150. Requires: 48MB RAM for Windows 95 and 98, 64MB RAM for NT 4.0; 80MB hard disk space for installation, up to 200MB for printing. Adobe Systems Inc., San Jose, CA; 800-562-3623; *www.adobe.com.*

Advanced Image Editing

Paint Shop Pro 6 brings some sophisticated imaging tools to the low-cost prosumer/SOHO market.

By Sally Wiener Grotta and Daniel Grotta

For those who have graduated from entry-level imaging programs, Jasc Software's Paint Shop Pro offers reasonably priced image editing—and Version 6 ($109 list or $99 direct) has some high-level features as well. But the program's workflow isn't smooth, and not all its features are fully implemented.

Paint Shop Pro's interface looks standard, with pull-down menus, a toolbar, and roll-up floating palettes. But many key commands aren't where you'd expect to find them, and the Help menu often lacks the simplest information. On the other hand, the layer palette is one of the best we've seen, providing control and information on the surface.

The new vector layers support editable text and object drawing tools, though this is confusing to use. None of the powerful raster tools and filters can be used on a vector layer; you first have to rasterize it. Nor are there comparable vector effects or tools, though the vector fit-text-to-path technique is superb and simple to use. So you have to give up the resolution independence of vector text and shapes if you want a sophisticated design.

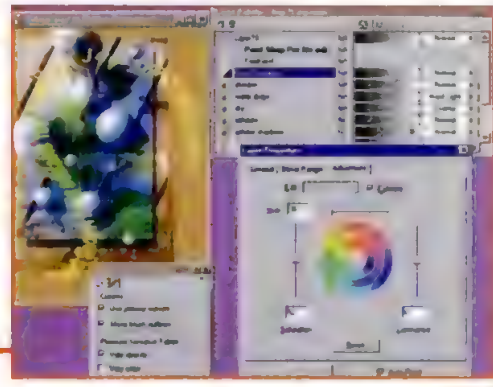
The raster side of the program has matured in Version 6. The raster special-effects library has been significantly increased, and the dialog for the new multicolor gradients with variable transparencies is as robust as any we have seen.

Paint Shop Pro 6 is probably the least expensive program to offer the power and re-editability of adjustment layers for key image-editing commands such as color balance, contrast/brightness, and so on. And happily, both raster and vector layers support this.

Export for the Web now has two excellent optimization dialogs, for JPEG and GIF. Both have zoomable before and after previews and download-time estimates to help determine which compression level and other settings are best for your needs.

Paint Shop Pro 6 is a good value. Unfortunately, it doesn't have the functionality and workflow speed of Ulead PhotoImpact 5 (First Looks, October 19) which costs $20 to $30 less.

ON TOP OF IT: *In Paint Shop Pro 6's layer palettes, mask, transparency, and blend information are accessible on the surface.*



Paint Shop Pro 6. List price: $109 (for package) or $99 (Web download). Requires: 32MB RAM; 30MB hard disk space; Windows 95, 98, or NT 4.0. Jasc Software Inc., Eden Prairie, MN; 800-622-2793; *www.jasc.com.*

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** Stanford Resources, Inc. Monitrak U.S. Desktop PC Independent Monitor Shipments Q2 '99 and Display Search, Quarterly Supply vs. Demand Study: Desktop Monitors Q2 '99.

Portable Data Storage

The IBM 340 MB microdrive Travel Kit advances the removable storage field for mobile devices.

By Bruce Brown

Need more room for image or audio files? The IBM 340 MB microdrive Travel Kit ($500 street), previously available only to select corporate customers, is now available to retail customers. The CompactFlash+ Type II card won't work in all devices that have CompactFlash slots, but for those with the proper configuration slot, including several professional-level digital cameras, some late model palm-size and hand-held Windows CE PDAs, and notebook PCs, the microdrive is a timely blessing.

The 16-gram microdrive draws 500mA of power in a CF+ slot. The single platter drive is rated at 15-ms average seek time with a media-transfer rate of 22.6 to 45.2 Mbps and sustained data-transfer rate of 1.8 to 3.0 MBps. The Travel Kit includes a compatible PC Card adapter and separate plastic travel cases for the drive and the adapter.

You should note that CF+ Type II cards are 5.0-mm high and will not fit in 3.5-mm high CF Type I slots. An updated list of devices compatible with the microdrive is maintained by IBM at *www.storage.ibm.com/techsup/hddtech/hddtech.htm*.

Although most CompactFlash devices have a tiny ridge on the outside edge or have an attached pull tape, the microdrive does not have an extraction aid. Therefore, it should not be inserted in a device that lacks a mechanism to eject CF cards.

For performance testing we used a Dell Inspiron 7000 notebook with the included PC Card adapter to time file transfer of two batches of files to the microdrive. When transferring a 52MB batch of 401 short document files in 18 folders, the microdrive took an average of 78 seconds, compared with a nearly identical 81 seconds for a Lexar 64MB 4X CF card using a PC Card adapter and 47 seconds for a Lexar 64 8X USB-enabled CF card using a JumpShot USB cable adapter.

COMPACT: *At 1.4 by 1.7 by 0.2 inches (HWD), the microdrive's tiny size is truly a marvel.*

With a second batch of 117 large-image and zipped files totaling 58MB in two folders, the microdrive's fast sustained data-transfer rate gave it the edge, taking an average of 68 seconds, compared with 79 seconds for the 4X CF media and 129 seconds for the 8X USB-enabled CF media. The microdrive is generally as fast or faster than CompactFlash flash media in real-world testing and cost effective on a per-megabyte basis (for comparison, the 64MB 8X USB-enabled Lexar media costs $270 street).

The IBM 340 MB microdrive Travel Kit is a valuable data-storage and transfer tool for professional mobile device users.

IBM 340 MB microdrive Travel Kit. Street price: $500. Requires: CF+ Type II slot. IBM Corp., San Jose, CA; 888-426-5214; *www.ibm.com/storage/microdrive*.

Enhance Digital Imaging

Lexar introduces the USB Enabled CompactFlash Digital Film and the JumpShot.

By Bruce Brown

Capacity, convenience, cost, and performance are the major factors in choosing removable media for mobile devices such as digital cameras and PDAs. The new Lexar USB Enabled CompactFlash Digital Film cards are available in capacities ranging from 16MB to 80MB in two performance-enhancing speeds, with list prices ranging from $69 to $299 for 4X Digital Film and from $79 to $349 for 8X. Lexar has also introduced the JumpShot USB Cable ($19.95 list), a reader/writer that works only with the new USB-enabled CF cards.

SWISH: *With the Lexar JumpShot Cable, USB-enabled CompactFlash cards appear to the computer as regular drives, with 62.5MB available, for example, with the tested 64MB card.*

As digital camera resolutions and resultant image sizes increase, digital photographers will naturally want memory cards of greater capacity and speed. Flash memory storage still isn't inexpensive, and Lexar hasn't broken through to higher capacity levels in CompactFlash, but the new products add convenience and performance at prices competitive with conventional CF media.

Three factors affect the time needed to process a digital camera image: CCD sensor speed, image processing and compression, and data-transfer time. The company uses the same speed-rating convention used with CD-ROM drives (150KB of data-transfer rate equals 1X). The new cards are guaranteed to be backward-compatible with conventional CF card-based devices and readers, although non-USB-enabled CF cards cannot be used with the JumpShot reader/writer.

Designed for both portability and low cost, the Lexar JumpShot USB Cable consists of a 30-inch-long cable with a USB downlink plug on one end and a 0.6- by 1.5- by 3.0-inch (HWD) module on the other end. To install the JumpShot, you insert a USB-enabled CF card and plug the cable into a USB port—power and data are both supplied via the single cable.

We plugged the JumpShot into a notebook USB port and into a USB hub; each test was an unqualified success. Two drivers are loaded by Windows 98, one each for the JumpShot and the CF card.

With faster transfer speeds via its USB-enabled CompactFlash Digital Film and an inexpensive reader/writer device in the JumpShot USB Cable, Lexar continues to provide the rapidly growing digital imagery market with vital products.

Lexar USB Enabled CompactFlash Digital Film. List prices: For 4X: 16MB, $69; 32MB, $129; 48MB, $159; 64MB, $229; 80MB, $299. For 8X: 16MB, $79; 32MB, $149; 48MB, $189; 64MB, $269; 80MB, $349.

Lexar JumpShot USB Cable. List price: $19.95. Requires: Microsoft Windows 98, USB port. Lexar Media Inc., Fremont, CA. 800-789-9418; *www.digitalfilm.com*.

PHOTOGRAPHS BY THOM O'CONNOR

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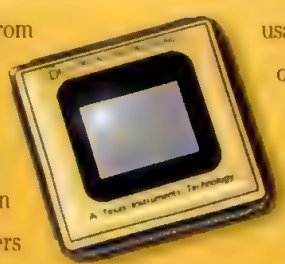

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TEXAS INSTRUMENTS

Save Time—and Clicks

Type a few keywords and go straight to the Web page you want with Actioneer 3.1 Smart Portal.

By Alan Cohen

Offering a clever, time-saving approach for pulling content off the Web, Actioneer 3.1 Smart Portal is a free download (*www.actioneer.com*) that's simple to use and easy to customize. The software acts as a front end between you and your browser, letting you find Web-based information without typing in URLs or calling up a list of bookmarked sites.

Click on the Actioneer icon in the system tray and a small, twin-paned window pops up. You type your search requests in plain English in the capture window to the left. Click the send button in the verify window on the right and Actioneer launches your browser and performs the search.

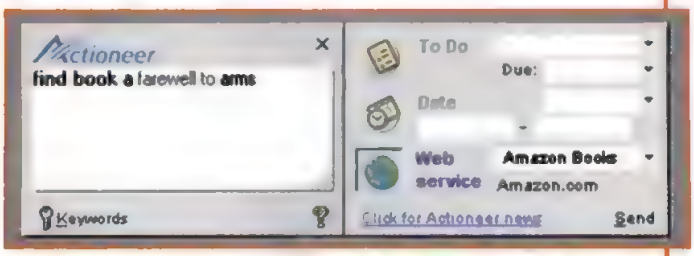
Currently, Actioneer works with approximately 100 Web sites, from Amazon.com to Yahoo! That list is growing, and the software updates itself automatically.

Each of these sites is keyed to a specific word or phrase. When one of these keywords appears in a search request, Actioneer knows to query the appropriate site. Fortunately, most of these phrases are intuitive ("news" will call up headlines; "tickets" will query Ticketmaster, and so on). Better yet, keywords can be edited, so you can customize phrases and their site associations.

Actioneer stores personal information such as your city, state, and ZIP code on your local drive. When you are seeking movie times or local weather, for example, Actioneer shares this information with the site, saving you the trouble.

Actioneer also interfaces with Lotus Notes, Microsoft Outlook, and Palm organizers. If it sees keywords relating to time or day, "Meeting with Todd 4:30 on Friday," for example, the software knows to insert the message in your datebook. In our testing, Actioneer scheduled these appointments flawlessly.

That's not to say the program is perfect. A minor quibble: Actioneer searches only one site at a time. The program works with multiple merchants in some areas, but you have to query each retailer separately. Actioneer 3.1 Smart Portal, however, is off to a very smart start.



FIND YOUR WAY: *Type "find book" followed by the author or title and Actioneer parses the request and picks a site to query.*

Actioneer 3.1 Smart Portal. Price: Free. Requires: Microsoft Internet Explorer or Netscape Navigator 4.0 or later; Microsoft Windows 95, 98, or NT. Actioneer Inc., San Francisco; 415-536-0700; *www.actioneer.com*.

RealJukebox Goes Final

RealNetworks finalizes its digital music player RealJukebox by addressing beta shortcomings.

By Jan Ozer

Beta versions of RealJukebox have been available for some time (reviewed in First Looks, June 22), but RealNetworks has now released the final version (a free download) as well as a Plus version ($29.99 direct) with enhanced features. (The company has also released RealSlideshow Plus, also $29.95, an enhanced version of its popular streaming image production tool.)

Both versions of RealJukebox let you download music from the Web, *rip* (copy) music from your CDs onto your hard disk, play audio files, and transfer them to portable players.

RealJukebox supports a variety of formats, including a2b, Liquid Audio, RealAudio, and MP3. RealNetworks has enhanced the player's support for the Liquid Audio format so that RealJukebox can now display graphics, liner notes, and lyrics.

One of the player's strongest features is its ease of use. Just pop an audio CD into your drive: RealJukebox comes to life and starts ripping the file in the background using your chosen format and data rate.

We were impressed by enhancements to RealJukebox's support for hardware MP3 players, including the Creative Nomad Digital Audio Player (First Looks, September 21), the Diamond Multimedia Rio PMP300 Portable Music Player (First Looks, January 19), and the RCA Lyra. You can *transcode* (simultaneously encode and transfer) RealAudio files to MP3 format in real time while transferring to the MP3 player. RealJukebox can also download sample files encoded at rates higher than 128 Kbps to players that accept a maximum MP3 bandwidth of 128 Kbps, again in real time, during transfer.

Although 128 Kbps is CD-quality audio, the Plus version of RealJukebox lets you record at even higher data rates (up to 320 Kbps in MP3 format). Additional Plus features include a 10-band graphic equalizer as well as enhanced organizational capabilities.

Although RealJukebox does not support every MP3 feature, the product's ease of use and support for a wide variety of formats and MP3 players could make it the first digital-audio application to reach a mainstream audience.

RealJukebox. Direct price: Standard version, free; Plus version, $29.99. Requires: 32MB RAM; 200MB hard disk space; Windows 95 with Service Pack 1 or Windows 98 or NT with Service Pack 3; Microsoft Internet Explorer 3.0 or later. RealNetworks Inc., Seattle; 800-444-8011; *www.real.com*.

TRACK RECORD: *RealJukebox features strong organizational capabilities and the simple ability to create fixed playlists, but no AutoDJ, a feature offered by MusicMatch.*

GIMME SOME SKIN: *RealNetworks' token tribute to the MP3 crowd was adding skins to its player, letting you customize its look.*

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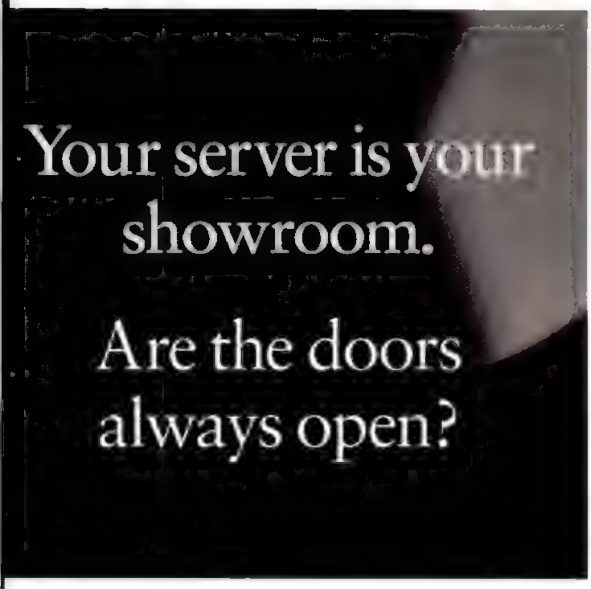

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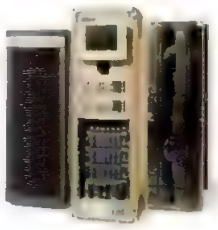

Left to right: Compaq AlphaServer, Compaq ProLiant, Compaq NonStop Himalaya

Better answers.℠

The Right Speakers for You

We look at new speakers from Altec Lansing, Cambridge SoundWorks, and Sonigistix.

By Marge and Bruce Brown

Now you can match a computer speaker system to your audio preferences more closely than ever, as vendors seek to differentiate sound systems for specific markets. Three new speaker systems from Altec Lansing Technologies, Cambridge SoundWorks, and Sonigistix Corp. offer appealing choices for varied applications.

The Altec Lansing ACS54 PowerPlay Plus for Gamers ($100 street) has four speakers and a subwoofer for individual or small group play. The Cambridge SoundWorks Desktop Theater 5.1 DTT2500 Digital system ($300 direct) plugs into PC-DVD and standalone DVD players to play full six-channel addressable surround sound for engrossing movie watching. And the Sonigistix Monsoon MH-500 speakers ($99.99 list) are a great choice for desktop music.

FAIR GAME: The ACS54 speaker system is great for game sound—at a low price.

Altec Lansing ACS54 PowerPlay Plus for Gamers

Want to pump up your gaming experience with volume, sound separation, and strong bass? The Altec Lansing ACS54 PowerPlay Plus for Gamers system pushes 40 watts of power from four satellite speakers and a subwoofer. You get a lot of enjoyment and gaming excitement for your money with this system.

The ACS54 setup includes all-black components with plastic satellite speaker cases and a wooden subwoofer case, which enhances the bass. The 40 watts includes 20 watts for the subwoofer, which has a 4-inch-long throw driver, and 5 watts each for the magnetically shielded satellite speakers, each with 3-inch full-range drivers. The system's frequency response is 38 Hz to 18 kHz with a crossover of 250 Hz. Two analog audio cables and four speaker cables are included.

Although you can use the speakers with a single analog audio jack, for best directional control, plug them into a sound card with dual audio outputs, such as the Creative Live! audio card we used for testing. The color-coded audio cables plug into jacks on the subwoofer, as do the four satellite speakers and the AC power cord. If you have an audio card with only one signal output, the system detects the lack of four-channel sound, and the front and rear speakers on each side produce the same signal.

All controls are located on the right-front satellite speaker, including an on/off switch on the back (with a power LED on front), a master volume control, and small dial to adjust the volume of the two rear speakers. The satellite speakers are shielded, but the subwoofer is not, so don't place it near a monitor. The two front speakers have small stands, and the rear speakers have built-in brackets for mounting on the wall.

When used with a dual-channel sound card, the ACS54 gives fine depth effects with 3-D audio games. The system isn't powerful enough to push dance music for a large party, but for one or two gamers in front of a PC, this setup is a lot of fun.

The low price for the Altec Lansing ACS54 PowerPlay Plus for Gamers is a plus, but the sound quality and the ability to plug into dual-channel audio cards for positional sounds are even more impressive.

Altec Lansing ACS54 PowerPlay Plus for Gamers. Street price: $100. Requires: Single or dual-channel audio output. Altec Lansing Technologies Inc., Milford, PA; 800-258-3288; *www.altecmm.com.*

Cambridge SoundWorks DeskTop Theater 5.1 DTT2500 Digital

Want to pull out all the stops for PC audio, including the ability to play back full Dolby Digital movie soundtracks and digital audio? The Cambridge SoundWorks DeskTop Theater 5.1 DTT2500 Digital system comes with loads of parts and components that enable you to play audio at peak listening levels. Setup requires more effort than usual, but the benefits of increased versatility and sound quality make the effort worthwhile.

The DeskTop Theater bundle includes a combination Dolby Digital decoder and six-channel amplifier (69 watts total), a subwoofer, a center channel speaker, and four surround sound satellite speaker cubes. That's 20 watts for the subwoofer, 21 watts for the center channel, and 7 watts each for the front and rear left and right speakers.

The system comes with a variety of desktop and floor stands and wall-mounting hardware as well as two 16-foot-long and four 9-foot-long speaker cables. Audio input wiring include SPDIF DIN, SPDIF RCA, and tandem dual-channel miniplug cables (SPDIF is a digital sound standard). To get the best gaming performance, you'll need a sound card with front and rear analog audio outputs; for the most enjoyment of DVD movies with 5.1 sound, you'll need an SPDIF output.

The decoder amplifier has input jacks on the rear for the SPDIF DIN and analog RCA cables and analog cables, output jacks for each of the included speakers, and a jack for an externally powered subwoofer. Four volume dials on the front of the amplifier adjust the master, center-channel, subwoofer, and surround sound rear speakers. The front left- and right-channel speakers' volume are

TRY THIS AT HOME: The DeskTop Theater system lets you play all kinds of audio at peak levels.

PHOTOGRAPHY BY THOM O'CONNOR

controlled by the master control.

If you have only analog audio input, the Creative Multi Speaker Surround processor can generate appropriate sound fields for music or movies. The Cambridge SoundWorks FourPoint mode works with 3-D games using Creative Labs Environmental Audio and Microsoft DirectSound 3D positioning and effects. We used the DeskTop Theater with a SPDIF DIN connector plugged into a Creative Live! Card and were astounded by the clarity and separation from a variety of audio sources.

You could use the Cambridge SoundWorks DeskTop Theater 5.1 DTT2500 Digital hooked up directly to a standalone DVD player just for watching movies, but if you use the variety of hookups and controls to connect to a PC with a capable audio card, the possibilities are endless.

Cambridge SoundWorks DeskTop Theater 5.1 DTT2500 Digital. Street price: $300. Requires: PC-DVD player with SPDIF, sound card with stereo output minijack. Cambridge SoundWorks Inc., Newton, MA; 877-937-4434; *www.cambridgesoundworks.com.*

MUSIC TO YOUR EARS. The MH-500 system lets you hear your music at its best, but stay close.

Sonigistix Monsoon MH-500

If you don't need room-filling volume, but you do want to listen to high-quality music while you work or cruise the Web, the Sonigistix Monsoon MH-500 system fills the bill. Using a combination of traditional cone and planar magnetic speaker technologies, the new Monsoon speakers do a fine job at an attractive price. You won't shake the windows with this system, but you'll hear individual instruments and appreciate vocal quality without disturbing people nearby and without headphones.

The MH-500 system includes a 17-watt powered subwoofer with a 4-inch driver surrounded by rubber and two hybrid satellite speakers with integral vertical stands. The 9.6-inch-high satellites are very thin, measuring just 1.0 by 3.9 inches (WD) at the top where the magnetic planar tweeters are positioned.

There is a 3-inch-thick bulge at the bottom of the speaker to hold the 2.5-inch cone midrange driver. Each speaker's tweeter and midrange draws 8.5 watts, for a total of 17 watts per speaker. To save desk space, each satellite has a 3.1- by 3.4-inch footprint (WD). A wired remote control, called Puck, has a mute button and a volume dial.

Although previous Monsoon models used full-range planar speakers, the MH-500 combines the company's patented planar magnetic transducer technology with a conventional midrange cone speaker. Using the cone speaker for midrange reduces the system's price while keeping the benefits of planar directional positioning with the tweeter.

When used with the bundled subwoofer, the sound of the MH-500 system is pleasing, if not overwhelming. The Altec Lansing and Cambridge SoundWorks speakers reviewed here almost beg to be played at high volume. The Sonigistix Monsoon MH-500 system can reach substantial volume levels without sound breakup or distortion, but the system works best in a relatively small space.

Sonigistix Monsoon MH-500. List price: $99.99. Requires: Stereo audio output. Sonigistix Corp., Laguna Hills, CA; 877-722-8346. *www.monsoonpower.com.*

Make Your Speakers Sing

Available as both hardware ($29.95 direct) and software ($10.00 registration fee), the SRS Labs WOW Thing gives the usual tinny output from your computer speakers astonishing concert-hall quality. The software plug-in is available only for the Nullsoft WinAmp player, though, so if you use another MP3 player, you must purchase the hardware version.

Both WOW Thing products are based on a new algorithm that expands music's dynamic range and the apparent breadth and depth of your speaker system. SRS Labs adds TruBass technology to both products, which deepens the bass sounds. During playback, you can adjust WOW Thing and TruBass levels and toggle WOW Thing effects on and off.

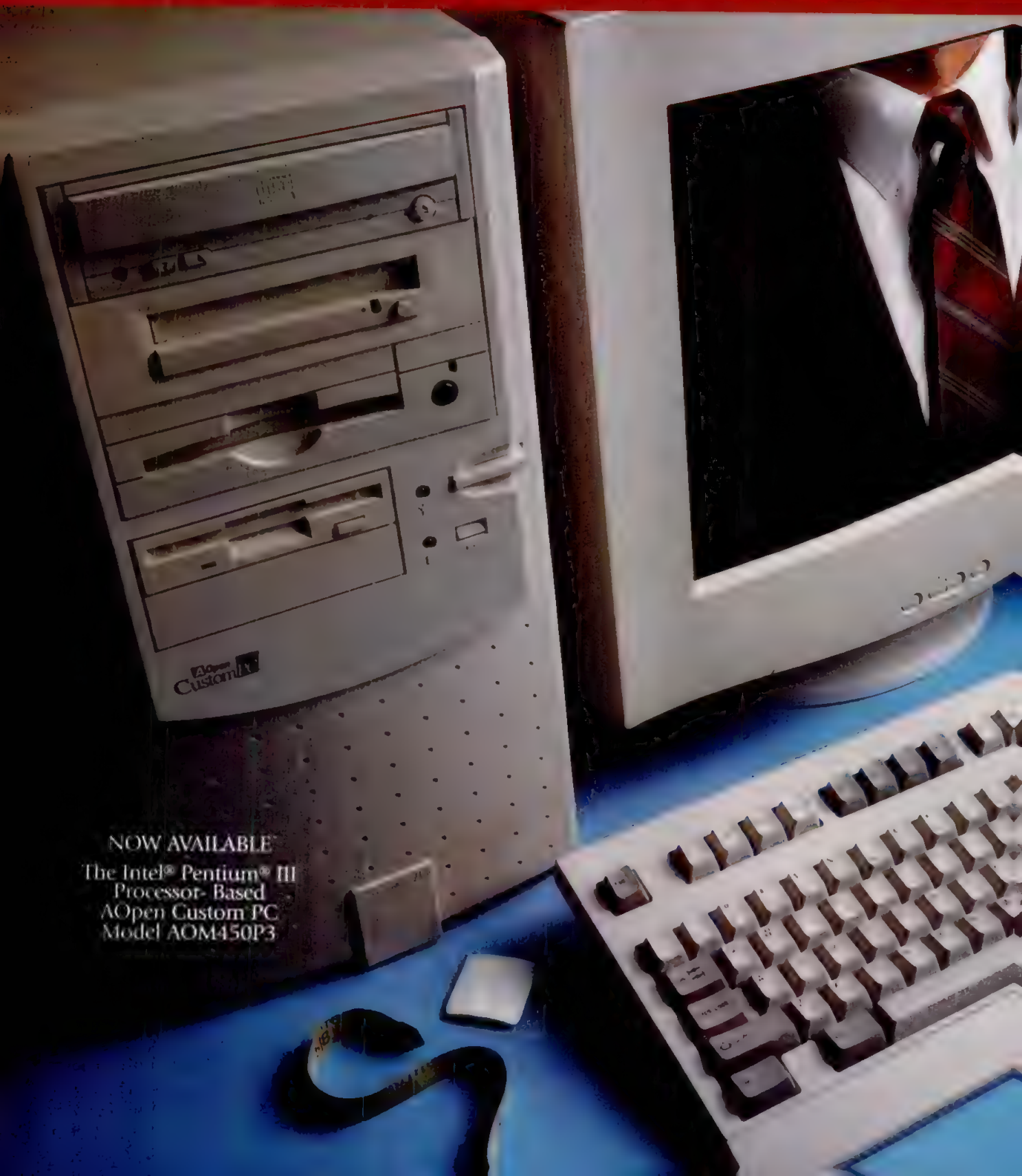
The WOW Thing hardware adapter accepts stereo audio input with output jacks for both speakers and headphones. The unit ships with a stereo-to-stereo adapter, perfect for sound card output, but you'll need additional cabling to attach the WOW Thing hardware to your TV or stereo. The downloadable software module installs as a normal WinAmp plug-in, though if you have a 3-D sound processor on your sound card, you'll have to disable it to get the full effect.

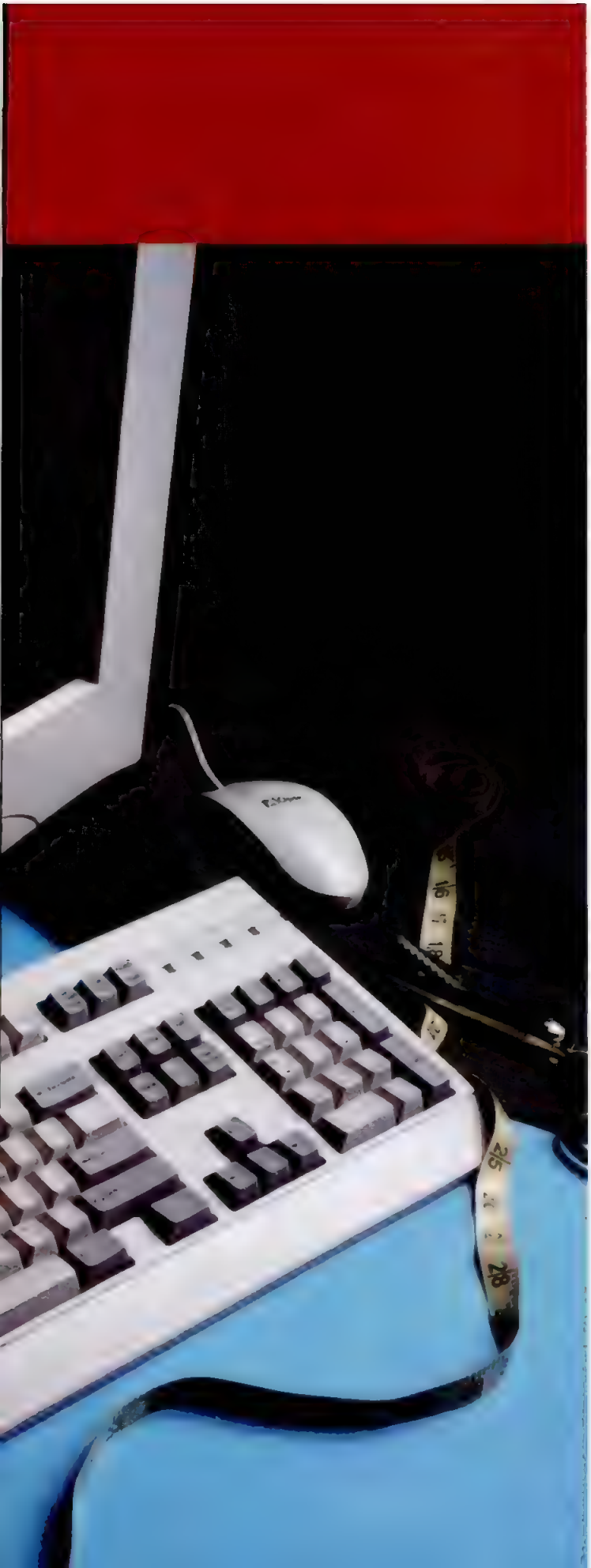
We tested the software module with several MP3 tracks, including jazz, electronic, rock, and heavy metal, played on a Pentium II/350 using a Cambridge SoundWorks PC Works sound system. We tested the WOW Thing hardware using the same setup, also testing output from a Diamond RIO 500, a television set, and a midrange sound system.

Our results were overwhelmingly positive. The sound of each instrument seemed fuller and more vibrant. But vocals were slightly obscured on ballads and rock music, which we alleviated by lowering the levels of WOW Thing and TruBass effects.—*Jan Ozer*

SRS Labs WOW Thing. Price: Software, free; $10.00 to register. Hardware, $29.95 direct. Requires: 16MB RAM, Microsoft Windows 95 or 98, the Nullsoft WinAmp (for software). SRS Labs Inc., Santa Ana, CA; 949-442-1070; *www.wowthing.com.*

The Custom Fit





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Accounting Made Easier

Both MYOB and Peachtree Complete Accounting have grown even more powerful.

By Kathy Yakal

Despite tough competition from market-leader QuickBooks, from Intuit, both MYOB and Peachtree Complete Accounting have survived and thrived. They're both industrial-strength, relatively easy-to-master, number-crunching workhorses that have done their best to introduce novice accountants to the dizzying world of GAAP-compliant double-entry accounting.

DOING TIME: *Time billing is now a part of Peachtree Complete Accounting.*

The latest versions throw a minimum of new features at current users and concentrate instead on making your company's existing financial framework more accessible, flexible, and meaningful. That said, existing users of either program might not find the changes significant enough to warrant upgrading.

Of most interest in Peachtree Complete Accounting Release 7.0 ($229 list) are new time-billing features and a revamp of the new company setup. And MYOB Premier Version 2 ($449 list) is the first small-business accounting program to support multicurrency accounting.

But these two programs have more attributes in common than they have differences. They both handle general-ledger, accounts receivable and payable, payroll and inventory, time-billing, and job-costing functions. They both generate simple and management-level reports, facilitate accounting transactions, and print the myriad forms needed by accounting departments. Both also let you set up multilevel security systems and maintain safe audit trails.

Deciding Factors

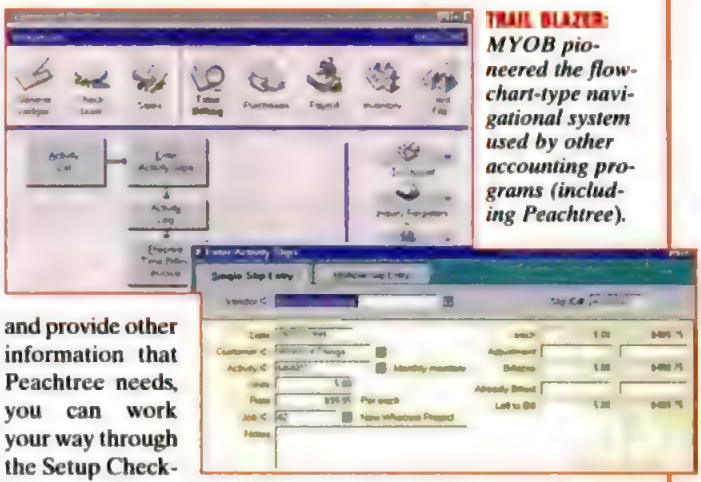
When two packages grow as powerful as MYOB and Peachtree have, two more elements become critical: company setup and daily navigation and operations. We like MYOB for the latter.

MYOB pioneered the flow-chart-type navigation tool that Peachtree and QuickBooks eventually adopted.

MYOB excels, too, at new-company setup. A wizard walks you step by step through the lengthy process of building your customer, vendor, employee, and inventory records; defining your accounts and related parameters; and establishing your relationship with the MYOB interface.

Peachtree has dropped its multimedia-heavy company setup tool for a much more abbreviated version. The New Company Setup Wizard asks for basic preferences, then presents a list of business types. Pick one that matches yours, then read about the accounting needs of that type of business, and Peachtree sets up a Chart of Accounts for you.

Peachtree also sets some default parameters, such as payment terms, credit limits, and inventory-costing methods. To build your records database and provide other information that Peachtree needs, you can work your way through the Setup Checklist or select items in the Maintain menu.



TRAIL BLAZER: *MYOB pioneered the flow-chart-type navigational system used by other accounting programs (including Peachtree).*

MYOB has half a leg up on Peachtree in the area of Microsoft Office integration. Both programs can easily whisk a report over to Excel, but MYOB also offers automatic Word integration for generating individual and mass mailings. Although MYOB can woo the international market with its multicurrency accounting capabilities, however, Peachtree has the edge in Web integration: Its PeachLink and companion Web software help you set up an electronic storefront and process the site's orders through Peachtree.

A Close Race

A feature-by-feature comparison between the two programs could go on and on, considering how powerful and flexible each has become. The fact is that both programs are well worth considering for new users, although we think MYOB has the edge (users who don't need multicurrency can buy MYOB Plus for less than half the price).

MYOB has grown quietly but impressively over the years. You won't go wrong with Peachtree Complete Accounting Release 7, either, but we give MYOB Premier Version 2 the nod in this round.

MYOB Premier Version 2. List price: $449. Requires: 16MB RAM; 40MB hard disk space; Microsoft Windows 95, 98, or NT 4.0. MYOB Inc., Rockaway, NJ; 800-322-6962; *www.myob.com/us.*

Peachtree Complete Accounting Release 7.0. List price: $229. Requires: 12MB RAM; 30–50MB hard disk space; Microsoft Windows 95, 98, or NT. Peachtree Software Inc., Norcross, GA; 800-228-0068; *www.peachtree.com.*

Keeping Time

For some complex businesses, the time-billing features of programs like MYOB and Peachtree aren't flexible, robust, or well-integrated enough to fill the bill. Office Timesheet 2000 provides a powerful, customizable framework for your company's time-billing records, with both a multilevel security system and over 150 reports. Office Timesheet 2000, though Web-enabled, is not as polished or pulled together as Timeslips (First Looks, March 9, 1999), and it also hasn't established as many direct links to related business applications.

Office Timesheet 2000. Direct price: For 5 users, $400. Requires: Microsoft Internet Explorer 4.0 or Netscape Navigator 4.08 (or later versions of either); 50MB hard disk space; Microsoft Windows 95, 98, or NT. Tenrox Corp., Montreal; 514-336-4567; *www.tenrox.com.*

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The Bigger, Better Picture

New technology makes a visible difference, as seen in the 50-inch Pioneer PDP-502MX.

By Alfred Poor

Although plasma displays are expensive, their thinness and sharp images give them an edge over CRTs for large-format, direct-view displays. The first-generation units have been impressive, but new technology gives the 88-pound, 50-inch-diagonal Pioneer PDP-502MX ($19,995 list) eye-popping contrast with a wall-filling image—and it's less than 4 inches thick.

The wide-XGA display (1,280 by 768 pixels) arranges subpixels in vertical stripes—long, U-shaped channels—as do other plasma designs. The key difference is that the Pioneer panel has horizontal dividers between each subpixel. Instead of a surface of long grooves, the panel is more like a huge waffle with rectangular depressions.

This breakthrough leads to a range of advantages. Each subpixel has a bottom and four sides, instead of just two. This provides more surface area for phosphor coating: More phosphor means more light from a given plasma discharge, so the charges can be reduced without affecting image brightness.

The lower charge results in lower power consumption—and less heat, so the cooling fans can be quieter. And the four walls of each subpixel contain the charge, so it doesn't leak into subpixels above and below in the column. This means that the erase pulse is eliminated, which further reduces power consumption and adds display time to each display cycle. The panel includes other innovations and improvements, including a new blue phosphor, image scaling, and a black-line contrast filter.

Even without knowing the technology behind the PDP-502MX, you can see that this is a different kind of display. All plasma panels glow a bit even when showing black, but the black level on the unit is darker and smoother than others. Colors are vivid, image brightness is uniform, and the display has a good tonal range for all but the darkest of gray shades.

Testing with DisplayMate software (*www.displaymate.com*) revealed a few defects, however. We observed some pixel jitter that could not be eliminated even after we tweaked the timing settings. The jitter showed up only on images with fine patterns. With an XGA signal, the image size and position had to be adjusted manually. And when the PDP-502MX displayed the 4:3 XGA resolution in its normal mode (not scaled to fill the screen), the aspect ratio was slightly off.

DIVIDE AND CONQUER: *The PDP-502MX's subpixels are subdivided, making for a crisper, quieter display.*

You probably won't be buying a PDP-502MX for every room in your house or office—but it's an attractive solution when space limitations and the need for an impressive display can justify the premium price.

Pioneer PDP-502MX. List price: $19,995. Pioneer New Media Technologies, Long Beach, CA; 800-926-4329; *www.pioneerusa.com.*

TV in Your Monitor

Tune in to television while you work on your computer, with the Miracle MonitorTV.

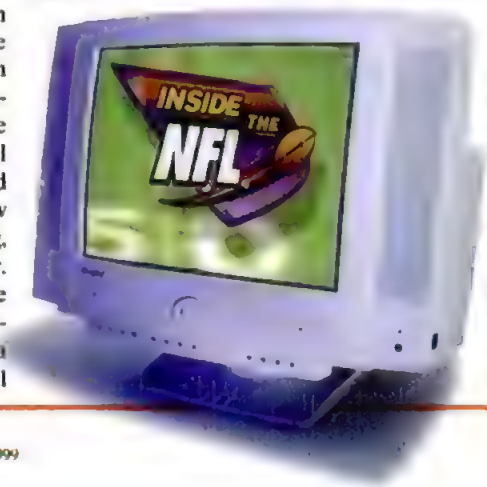
By Alfred Poor

Like many other monitors, the Miracle MonitorTV ($350 street), from Miracle Business, comes with attached stereo speakers, front-panel controls for an on-screen display, and a tilt-and-swivel base. But it also comes with a remote control, so you can change channels—because the monitor contains a television tuner.

The display (with 0.27 mm vertical dot pitch, 0.23 mm horizontal) is rated for up to SXGA (1,280-by-1,024) resolution and for a 16-inch viewable area. The back panel has a standard 15-pin VGA connector as well as inputs for antenna or cable signals and S-Video.

The stereo speakers are not well integrated into the monitor; instead, they're bolted to the sides. The speakers require their own separate power adapter, and the sound connections between the computer, monitor, and speakers result in a small snarl of wires. The MonitorTV's 90-channel tuner can scan and find all the available signals. During testing, it was able to pull in broadcast stations even in a fringe reception area.

Using the MonitorTV's remote control, you can quickly switch back and forth between the computer display and the television image; the sound defaults to the television programming. And you can also switch to the AV sound signal to hear what's coming from your sound card.



FLIP OUT: *On the MonitorTV, you can switch between the computer display and the television image.*

We tested the display using DisplayMate software from DisplayMate Technologies (*www.displaymate.com*) at XGA (1,024-by-768) resolution. The MonitorTV showed very good convergence and a helpful assortment of effective screen-geometry adjustments.

Screen uniformity was poor, however, with distinct discoloration in the upper left-hand corner of the image. This could have been caused by a defect in the CRT or by a magnetic field from the speaker attached to that side of the screen. The monitor was also weak in terms of bandwidth; fine vertical black-and-white lines tended toward gray compared with horizontal lines. And the screen showed some regulation problems.

The Miracle MonitorTV has some flaws and rough edges. But if you need—or want—a TV on your desktop along with your monitor and don't have room for both, this device provides a serviceable solution in a single, affordable unit.

Miracle MonitorTV. Street price: $350. Miracle Business Inc., Upland, CA; 909-946-9688; *www.miraclebusiness.com.*

PHOTOGRAPHY BY THOM O'CONNOR

PC 300GL

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The Digital Doorman

BlackICE Defender helps guard your home or corporate system against attacks from the Internet.

By Oliver Kaven

Accessing the Internet is fun again, with lightning-fast DSL and cable-modem connections. The problem is that the Internet can access your machine as well. Use BlackICE Defender ($39.95 direct), Network Ice's intrusion-detector program and you'll be surprised to see how much network activity is aimed at your PC. Not all of this activity is hostile, but some of it is—such as Trojan horse programs that try to obtain vital, personal data from your PC.

To ward off these attacks, most users implement a *firewall:* a hardware or software mechanism that allows only specific traffic from the Internet to reach your internal network. The most commonly used are packet-filtering firewalls, which examine network layer data of all incoming and outgoing traffic and compare the information against a table of rules.

But firewalls are maintenance-intensive—and as you implement new services or protocols on your network or home machine, more holes open up in your defenses. Also, dial-up connections can allow intruders access to internal network resources without having to pass through a firewall or proxy.

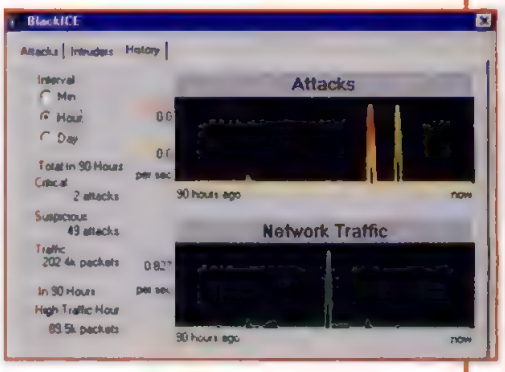
This is where BlackICE steps in. Rather then relying on security mechanisms that are put in place on the server or router side of a network, BlackICE is installed on each workstation or PC. Unlike a firewall, BlackICE dynamically adjusts the degree of security as it watches for attacks against your system. When an attack is executed, the program blocks all access from the intruder's IP address.

Like virus scanners, BlackICE uses a signature file to detect hostile traffic. You must update this signature file frequently at the company's Web site, but the product includes one year of free updates.

BlackICE's simple interface lets you take control of the degree of security you want to implement. You can select a Confidence Level: Trusting, Cautious, Nervous, or Paranoid. The product defaults to Cautious and adjusts the Confidence Level depending on the frequency of attacks launched against your system.

BlackICE runs almost unnoticeably and reminds you of its existence only when you are being attacked. A graph tracks network and attack activity based on time and severity. And information about the intruder and the type of attack is displayed and can be saved in a packet and evidence log. Trusted addresses can be selected, flagging them as harmless.

For home users, BlackICE can be an indispensable line of defense. On the corporate side, BlackICE adds another layer of protection to the network.



SAFETY NET: *BlackICE's History overview displays attacks and network traffic.*

BlackICE Defender. Direct price: $39.95. Requires: Microsoft Windows 95, 98, or NT Workstation. Network Ice, San Mateo, CA; 650-341-6886; *www.networkice.com.*

Keep Your Disk Together

The original solution for Windows NT disk defragmentation, Diskeeper keeps getting better.

By Jeremy A. Moskowitz

For a long time, there was only one name in Microsoft Windows NT disk defragmentation: Diskeeper, from Executive Software. Other names have popped up, but Diskeeper has kept up with the competition. Microsoft Windows 2000 will include a Lite version of Diskeeper that must be invoked manually. If you want to set it and forget it, however, you'll need to step up to Diskeeper 5.0 for Windows. Version 5.0 ($50 street) runs on Windows NT 4.0 (Server and Workstation) and now Windows 95 and 98 as well.

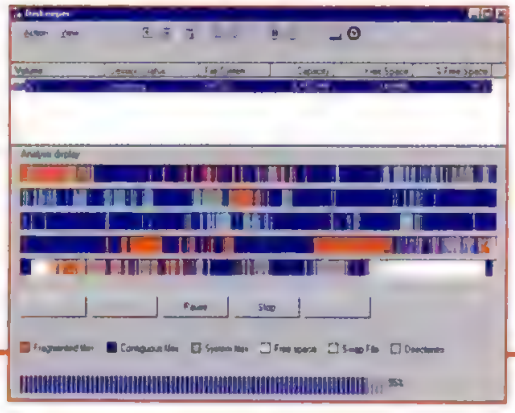
Loading Diskeeper is a snap. The program guides you through the installation, and if you don't have Version 1.2 of the DCOM components or Version 1.1 of Microsoft Management Console, the setup routine will install them for you.

Diskeeper has three modes of operation—Manual, Set It and Forget It, and Boot-Time. In Set It and Forget It, you can set Diskeeper up to work automatically when the computer is idle or while you work. Boot-Time defragmentation is available only for Windows NT. In this mode, the NT paging file, directory listing, and master file table (MFT) are all defragmented each time you restart your system.

But Diskeeper actively tries to avoid MFT and paging file fragmentation in the first place, with its innovative Frag Guard technology. Frag Guard actively monitors the MFT and paging file, providing room for each to grow as necessary. If fragmentation occurs, you can set how often the machine is automatically rebooted. Upon reboot, the MFT and paging file will be contiguous.

The server version of Diskeeper has the added ability to kick off the defragmentation process on networked workstations. The administrator can remotely select which workstations will start running Diskeeper.

Diskeeper 5.0 for Windows adds a battery of features where the Lite version leaves off, making it the best solution for keeping Windows hard disks in line.



À LA MODE: *Diskeeper can be run in three modes, including Manual (pictured).*

Diskeeper 5.0 for Windows. Street price: $50. Requires: Microsoft Windows 95 with OSR 2, Windows 98, or Windows NT with Service Pack 3 or later; Microsoft Internet Explorer 4.01 (IE 5.0 recommended). Executive Software International, Glendale, CA; 800-829-6468; *www.executive.com.*

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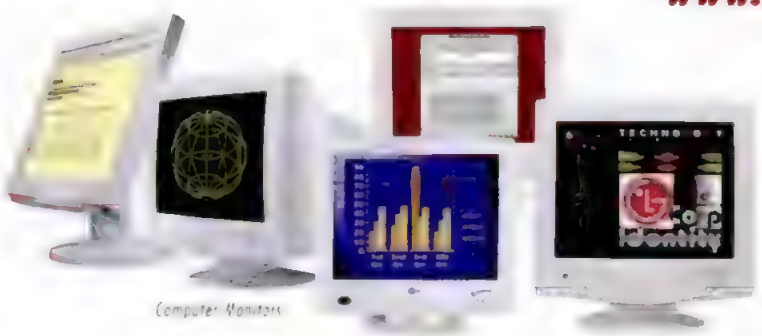

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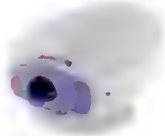

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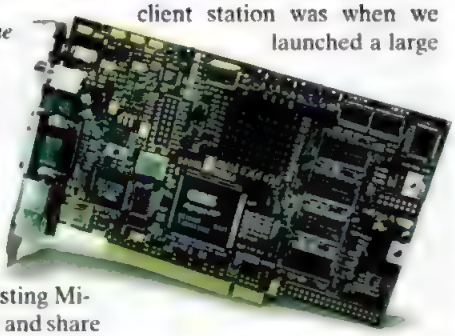
Clone Your PC

The Applica Multimedia kit makes your home PC fun for the whole family—at the same time.

By Steve Rigney

Arguments over the use of the home PC are becoming almost as common as fights over who gets the TV remote control. PCs have gotten much cheaper over the past year, but a sub-$1,000 system is still a major purchase. Fortunately, there's a better way to share the PC you already have.

The Applica Multimedia ($249 list) kit comes with an adapter and software that lets you connect a second monitor, keyboard, mouse, and speakers to your existing Microsoft Windows PC and share all of your applications, including Internet access and multiplayer games. You can even connect a TV and watch DVD movies if your PC is equipped with a player.



▶ **OPEN AND SHUT:** *The Applica Multimedia kit is fairly easy to install, although you must open your PC's case and install the PCI adapter.*

The product requires a Pentium-class PC with at least 32MB of RAM. After we installed the adapter, Windows 98 detected the new hardware and prompted us for the drivers. The next step was to install Applica Control Center, which lets you set up the other users on your PC.

The Applica Multimedia kit lets other users customize their own screen settings and Windows passwords. For example, we created a user that had rights only to certain applications, and we were able to disable system tools, such as Control Panel applets. This is a good way to protect your host PC and limit access to certain applications.

Our biggest concern with the Applica Multimedia kit was possible performance degradation on the host PC when the second user was active, but we didn't notice much of a hit for either user. The PCI adapter contains its own 8MB Savage video adapter so the second user's video will run at speeds of 60 frames per second.

The connection between the adapter and the host PC runs at 132 MBps, faster than most networks. In fact, the only time we noticed any slowdown on the client station was when we launched a large application such as Microsoft Word on the host PC. Performance increased once the application was running.

The only drawback to the Applica Multimedia kit is that your connection is limited to 15 feet. Of course, you also need to come up with a spare monitor, keyboard, and mouse.

Ideally, all families would have the budget and expertise to purchase separate PCs and set up an Ethernet-based LAN to share files, printers, applications, and an Internet connection. But for many, that's simply not feasible. The Applica Multimedia kit is a great way to get some extra mileage out of your existing PC.

Applica Multimedia. List price: $249. Requires: 132MB RAM for each user, Microsoft Windows 95 or 98, available PCI slot. Applica Inc. (Division of Concurrent Controls Inc.), San Francisco; 800-487-2243; *www.applica.com.*

WALK, DON'T RUN: *The SafeCom secure printing device saves you from running to your network printer to retrieve confidential printouts.*

Private Printing

Keep personal documents private when printing to your network printer with the i-data SafeCom.

By M. David Stone

In most offices today, the personal desktop printer has all but disappeared, and the closest network printer is often out of sight. This creates a problem when printing files that not everyone should see—such as performance appraisals, budget spreadsheets, or legal documents. Few network printers offer *private printing*, a feature that holds print jobs in memory until someone walks to the printer and enters a password. But the i-data SafeCom ($1,895 list) can add that ability to any printer on a Microsoft Windows NT network.

The package includes two units: the EasyCom, which is an external print server, and the SafeCom, a box with an LCD touch screen and a card reader that controls the private printing features. You also get 10 credit card–style cards for users. Additional cards are $35 (street) for a pack of 10 or $210 (street) for a pack of 100.

Setting up the package is similar to setting up any network printer under Microsoft Windows NT. The added twist is that you also have to set up the security. After you've installed the software, plugged in the hardware, and assigned an IP address, you find a personal user code in the SafeCom's administration software. Next, you take a card and swipe it though the card reader on the SafeCom and enter a PIN code for that card. You repeat essentially the same procedure for each card.

Once security is set up, you send documents to the printer as usual, but getting print jobs from the printer is a lot like getting money from an ATM. First you swipe the card though the reader and enter your PIN code. The SafeCom will respond by telling you how many documents are waiting.

You then have the choice of printing all of your documents, displaying the document list, or printing the document list. If you choose to display the document list, you can delete jobs, print a job but hold it in memory, or print from 1 to 99 copies of a given job.

If you are continually worried about some people seeing documents that others in your office are printing, the i-date SafeCom can put your mind at ease. The device not only adds private printing to your printer, it offers a few extras. Though the package may cost more than the network printer it's attached to, the SafeCom can be a cost-effective solution, depending on the number of users that require private printing.

i-data SafeCom. List price: With the EasyCom print server, $1,895; without, $1,695. Requires: 128MB RAM, 100MB hard disk space, Microsoft Windows NT 4.0 or later. i-data International Inc., Arlington, VA; 800-432-8246; *www.i-data.com.*

PHOTOGRAPHY BY MARK WEMPLE

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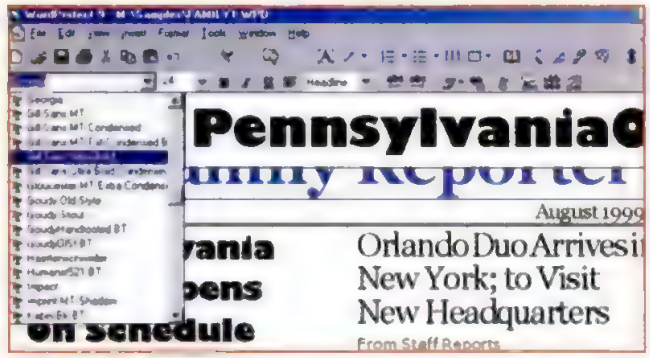
Closer to Perfection

By Edward Mendelson

Almost everything in Corel WordPerfect Office 2000 looks the same as before but works faster and more reliably. And users are emphatic in declaring their loyalty to WordPerfect—even when they can no longer use it at work because their offices have switched to Microsoft Word and the rest of the Microsoft Office suite.

Those with earlier versions of WordPerfect need virtually no retraining, because the minor changes in the menu structure are all designed to clarify and simplify. New navigation, preview, and printing options are slotted in so unobtrusively that you can ignore them until you need them. And because WordPerfect's classic file format allows new features to be added without affecting compatibility with earlier versions, files can be exchanged smoothly with WordPerfect users who still have the DOS version.



LOOK BEFORE YOU FORMAT: *The real-time preview lets you eyeball changes before making them.*

Most of the major improvements in the upgrade were made in massive rewrites to WordPerfect and Quattro Pro, to improve speed and reduce their disk and memory requirements. Both programs have a real-time preview that displays the effect of font and other formatting changes in the document before actually applying them, and WordPerfect has an editable two-page view.

Compatibility with Microsoft Office and SmartSuite files is impressively smooth, and files can be saved in their original formats after editing. Stability and compatibility glitches in the first release were fixed in a service pack posted on Corel's Web site during our online discussion. You can get the service pack free if you have time for a 36MB download, or you can order a CD-ROM for $9.95.

Respondents consistently praised WordPerfect's ease of use in comparison with Word. Truth is, Word is clumsier than WordPerfect in handling such basic format features as margins. WordPerfect's Reveal Codes feature was also cited for giving users complete control over content and format. The stripped-down and efficient CorelCentral PIM received some praise, but Quattro Pro was scarcely mentioned.

WordPerfect Office 2000 won't win converts from users of other suites, but WordPerfect loyalists will find the upgraded version faster and smoother; it feels more like a tune-up than an upgrade. By contrast, the upgrade from Microsoft Office 97 feels more like a whole new vehicle.

Y2K Tests: Not a Priority

By Edward Mendelson

You may wake up in a sweat thinking about the Y2K bug, but your personal computer probably won't notice the problem. If your PC can connect to the Internet, it will probably slip into the new millennium without difficulty. For personal computer users, virtually the only potential Y2K problems are hidden in spreadsheets and databases, where two-digit numbers can cause errors in formulas or sorting routines. But our online readers who commented on Symantec's Norton 2000 didn't seem particularly worried.

Norton 2000 (based on Viasot's OnMark 2000 Assess) includes two kinds of tests. One is a set of Y2K system-readiness tests of the same basic kind that are available free from many Web sites. The other is a set of more advanced tests that scan spreadsheets, databases, and Visual Basic source code embedded in Microsoft Excel and Access files to find ambiguous two-digit dates and codes that allow the entry of ambiguous dates.

Some readers observed—correctly—that the first kind of test is hardly worth using. Almost every recent PC will pass these system tests, and the few that don't pass can be fixed easily with a memory-resident program that can be installed from the Norton 2000 disk.

Only one reader used the second type of test—and told us that the file scanner detected problems in files that had no Y2K problems, then gave no indication of what might be done about the problems it reported. An automated Fix Assistant makes short work of correcting problems in Excel files—but not in any other files.

No one commented on Norton 2000's applications scanner, which compares the programs on your disk with an internal database of programs with potential Y2K problems. Applications are flagged with the seriousness of each problem and, in many cases, a Web address where you can find a fix. But if Norton 2000 finds programs on your disk that it can't recognize, it flags them as potential problems—even if they are merely arcade games or children's word games.

Our visitors seem mostly unconcerned with the Y2K bug. Here's hoping they're right.

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Tell us what you think.... How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product each week and summarize your comments here. Following are some of your comments from our discussion of Corel WordPerfect 2000.

The new version strengthens WordPerfect 2000's *already strong word processing, with such powerful new features as the ability to publish a document as a PDF file. WordPerfect 2000 also shores up an area that was a bit lame in Version 8: CorelCentral, which has abandoned trying to be an integrated Web browser/e-mail client and now works with any e-mail client.*

—Ed Adams

Corel could have included more advanced features *given the time elapsed since the release of WordPerfect 8, but WordPerfect has always been and remains an extremely powerful product and one that is superbly designed. If only computer magazines had not nearly destroyed WordPerfect's reputation by constantly praising Microsoft!*

—Marc-André Roberge

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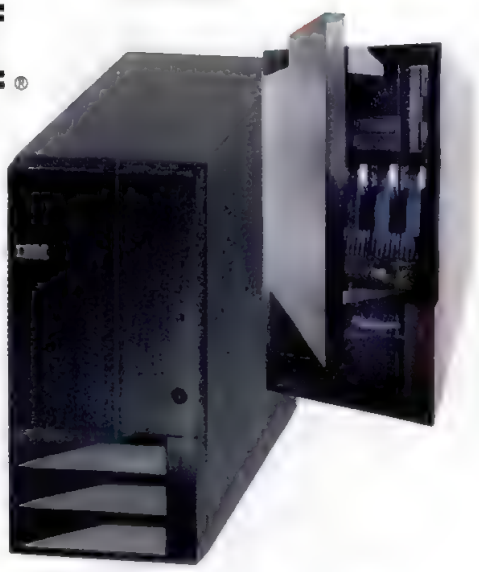

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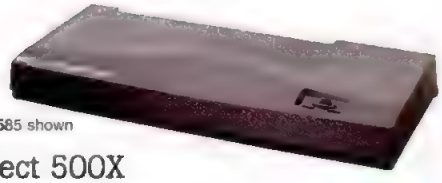

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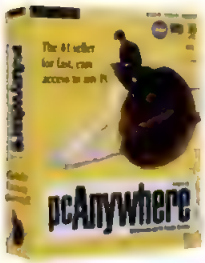

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Music Classes on the Web

You don't see a technological breakthrough every day. We get more than our fair share here at *PC Magazine*, but it's always rewarding to see the completion of a long-standing goal. Computer-based music education has taken a giant step forward, plus a little more. Not only has it become interactive, but it's also online. In the absence of a human instructor, interactivity is the next-best thing, and in the case of teaching adults, interactive software may be better than a human instructor, because students don't have to feel embarrassed about learning the basics or endlessly drilling to get simple exercises down pat.

Interactive music education software differentiates itself from the usual music education software by listening to you play and adjusting its behavior accordingly. Some instructional software that has you enter responses via the computer keyboard or the mouse calls itself interactive, but in my book, it's not. Although you can find lots of courseware for the piano and the guitar, most of it uses your computer as little more than a VCR that plays instructional videos. To their credit, such CD-ROM–based lessons let you jump around, and the software tracks your progress. Much of this courseware has excellent instructional content, and I've mentioned titles such as Ubi Soft's Classic Rock Guitar, Alfred's Guitropolis, and Midisoft Play Piano in previous columns.

Until now, interactive instruction has required that you hook a MIDI keyboard up to your computer so it could watch what you played. Except for expensive MIDI guitars, other instruments were excluded. Several years back, however, Philadelphia-based start-up Gvox created an easily attached pickup for guitars that could distinguish what note you were playing on which string. Gvox also created courseware that capitalized on the computer's knowledge of what you were playing, prompting you to stay in tempo or waiting until you played the right note. The pickup, however, requires an external interface box, which increases complexity because of the additional wires and connections.

Wouldn't it be better if you could just plug in your guitar or play your instrument into a microphone? That's the Holy Grail for interactive music education software, and the challenge is to recognize the notes quickly and accurately enough to drive the instruction software. Lots of dedicated devices, from electronic guitar tuners to sophisticated harmonizers that correct and harmonize singers' voices can recognize notes, but the challenge is doing it with nothing more than the audio hardware found on every PC.

The first such product that I've seen is again from Gvox: instructional software for everyone's school-age beginner instrument, the soprano recorder. You can get your recorder lessons two ways: on CD-ROM—in a kid-oriented package called Ricky Recorder, which includes a Yamaha recorder and a small microphone that can be attached with Velcro to the recorder—or in free, Web-based lessons using your own recorder. In fact, it's up and running on Excitextreme (*www.exciteextreme.com/index2.html*). You have to download the note recognition module, which runs transparently in your browser as it communicates with courseware on Excite's server. The site also has interactive keyboard instruction, which uses a conventional MIDI keyboard and your PC.

Gvox's real-time, PC-based, monophonic (one-note-at-a-time) note recognizer is not the first, but it is the fastest I've seen. Others I've seen have mostly been applied where speed is less important, as in Fast & Soft's program, Sight-Singer, which recognizes the pitch of your voice and trains you to sing notes and intervals accurately. The speed of Gvox's recognition engine will open the door to interactive lessons on many different instruments, as well as to recording into notation and sequencing programs.

The next big challenge is polyphony. Keyboards are naturally polyphonic instruments, but with MIDI, it's easy to recognize multiple notes played at the same time. Polyphonic note detection through a microphone, however, has been the subject of intensive research. The challenge, once again, is to make it work with nothing more than the PC's sound card. Gvox is hard at work on the problem, as are others.

Learning from other musicians will continue to be the most important and often the best way to master an instrument. But the Web opens up new vistas of never-stale courseware and instant availability, as well as the opportunity to try new instruments or dust off old ones. PC

PHOTOGRAPHY BY JAY NEED

Gvox's recognition engine will open the door to interactive music lessons on many different instruments.

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One Child, One Laptop

I haven't discussed computers in schools for years and years. Has it become a nonissue? Is it that we're up to speed and we're just not using them appropriately? Apparently not. At least that's what I was led to believe by a series of articles on the topic and a recent episode of "Silicon Spin," where I was told the same old problems persist, namely (1) too few computers in a classroom to be useful, (2) old computers, (3) misuse of computers, and (4) ill-trained teachers. I was under the impression that these problems were fixed years ago. Now I wonder whether they will ever be resolved.

If the school system is not necessarily supposed to teach us facts but instead is supposed to teach us how to learn, how is it that the learning principles don't apply to the teachers themselves? In other words, they are experts not only at teaching but also at learning. Do they need training to learn how to use a computer? Or do they simply need a good computer?

Let's face it, it's not hard to learn how to use computers, although they are daunting at first. But once a few basics are understood, then the process becomes individualized and you teach yourself. Only a very few ever take a course or get formal training on computer usage. I don't know anyone writing about computers, for example, who has ever taken a course on computer use. Some have taken computer science courses that go into great technical depth, and some have taken programming courses for difficult languages. But the basic stuff is pretty much learned through exploration.

It's possible that someone teaching literature who eschews even the typewriter might find a computer daunting or frustrating. The computer's impersonal nature frightens some people. But computers have been on the desktop for over 20 years, so I'd think by now all teachers would be computer experts. And I see no need for formal training to achieve this easy goal. (I think we must reconsider our national policy of underpaying teachers, too, which may have something to do with it.)

We need a national program to put more up-to-date computers in the classroom. In fact, each child in the country should be equipped with a ruggedized laptop that will be upgraded every three years, beginning in the fourth grade. This means new computers in the seventh and tenth grades, which amounts to three machines, lasting through nine years of school—right up to college.

The children would take these computers with them everywhere, and all the machines would be Ethernet-equipped and networked in the classroom. There is always talk of a "standard" educational machine, and I see no reason why that can't be done over two or three generations of machines as well as numerous models of machines. Thus, a Toshiba-centric schoolchild could transfer to a ThinkPad-centric school system and continue to use the Toshiba.

The machines can be equipped with a government-funded OS or Windows or Linux—whatever is most cost-effective. Public-domain and special educational packages would be licensed on a school-district-wide basis and downloaded to each computer as needed over the network. The child could upload a program at home if the family has other computers. The laptop could also be a standalone PC for the family, with an attached monitor and keyboard. A national insurance program would be in place to cover lost or damaged units. Stealing would be less of a problem, as all children would have machines.

A classroom would have all children networked, with an open laptop on each desk. All tests, writing, and note taking would be done on the keyboard. There is no question that one day a classroom will look like this. Loaded with laptops. The question is, when will we bite the financial bullet and do it? How many people can currently afford to buy three notebook PCs over a nine-year period? Assuming that the future notebook will sell for about $1,000, this is only $3,000 per child. With a combination of local, federal, and personal funding I don't see a problem with the costs of such a proposal.

As things now stand, computers are barely integrated into the school environment. And there are only a few schools here and there that do it well. This is the wrong approach. School desktop computers that spend most of the time unused don't add up to an efficient model. Shared computers are not an efficient model. We need notebook machines for every child.

Each child in the country should be equipped with a ruggedized laptop that would be upgraded every three years.

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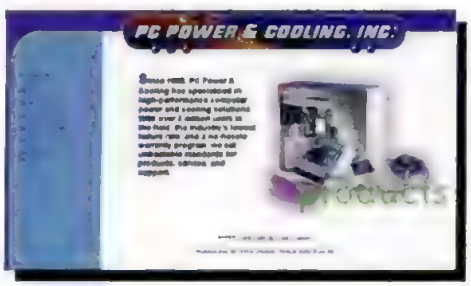

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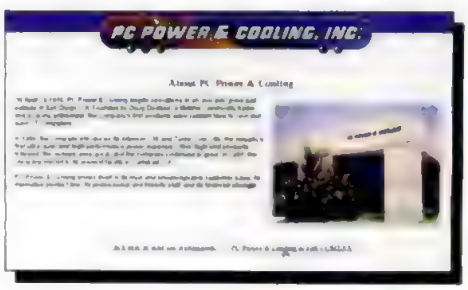

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INSIDE TRACK

Over the past few months it has been amusing to watch Intel shift orientation from the **clunky Slot 1** packaged processor to Socket 370. This column **predicted** the demise of Slot 1 from its inception, since it was invented only because Intel couldn't find enough die space to put an L2 cache directly on the chip. The **propaganda mill** for Intel insisted that Slot 1 was invented because of the speed limitation inherent in any socket design. Now the company says Slot 1's speed is limited and the socket is better. All I know for sure is that is has to be **a lot cheaper** for Intel to make a chip that plops into a socket than a huge module.

The online publication The Register (*www.theregister.co.uk*), out of England, follows a lot of the shenanigans of both Intel and Microsoft. Somewhere along the way, The Register got hold of an **internal memo** from Intel that described in great detail its PR policies and methodologies. Primarily written for the European Intel PR professionals, the memo includes a number of **amusing generalities** about certain cultures' attitudes toward Intel and technology that would be considered politically incorrect.

Somewhere along the way, the British online publication The Register got hold of an internal memo from Intel that described in great detail its PR methodologies.

Here are a few of the comments in the memo that tickled me: "Avoid using Swedish examples in other Scandinavian countries. . . . Acknowledge that Scandinavian countries are on the edge of technology. . . . Try to find a human or environmental angle to the story." And here's an amusing quote: "Spaniards are not particularly interested in technology." And regarding the Dutch: "There's a contramove [sic] against anything successful." The kicker's for Italy: "Italians are often late. . . . Always pick up the bill." It goes on and on.

The Register has had a number of interesting stories over the past few months, including one that triggered a thought. Apparently, the Linux-sponsored movement to force Microsoft to give users their money back for unused preinstalled copies of Windows is growing in France. Microsoft really hates this idea. There may be a new twist as to why.

At the Systems Builders Summit in Boca Raton this past summer, the small system vendors were **constantly carping** about the price they pay for Windows compared with the supposedly lower prices paid by the likes of Compaq and Dell. Since Microsoft says **everyone pays the same,** is it possible that Microsoft doesn't want to offer refunds because it would have to refund more than the actual cost of the product on certain platforms? That would **be humiliating.** Just a thought.

Check This Out Dept.: The Web has become a wonderful conduit for all sorts of **odd hobby sites,** none more interesting than the Fourmilab site (*www.fourmilab.ch*) in Switzerland. This is where **Autodesk founder** John Walker is holed up. It's his personal site, and it contains a lot of useful Autodesk strategies, including corporate presentations. Also on the site are favorite and obscure utilities for Unix, Windows, and palm computers as well as **various Walker rants and observations.** This site could keep you busy for days. Walker even has a **diet plan** and some original science fiction posted on the site.

Whither Smart Media Dept.: The battle between the two flash memory formats for digital cameras seems to be coming to a head or getting more complicated, depending on how you look at it. Sony added its proprietary **memory stick** to the fray, which I believe will eventually become the Betamax to Compact Flash's VHS. The odd man out may be the little Smart Media card. Agfa is **abandoning** Smart Media in favor of Compact Flash, and the **newest offering** from Olympus (the real force behind Smart Media) has two slots, one for Smart Media and the other for Compact Flash. If Olympus eventually bails out, then Smart Media will be dead.

The problem with Smart Media has been **capacity;** it hasn't been able to keep up. To shoot megapixel photos you need a lot of memory. In the Compact Flash format **64MB cards** are common, but finding even a 16MB Smart Media card is difficult. Lexar Media, the leading third-party memory maker for digital cameras, makes a high-speed Compact Flash module that **accelerates** loading. More interesting is that fact that Lexar now **gives away a USB reader** with the new USB-enabled cards. This little Lexmark module plugs into a USB port and turns the Compact Flash card into a virtual disk drive. *Très* cool.

As for Agfa's change to Compact Flash, that's apparently not all it's going to do. The company looks as if it will **incorporate a diminutive Iomega Clik! Drive mechanism** into a future camera. This 40MB device has recently been worked into a new, smaller PC Card package into which you can insert the media. Very nice indeed. Iomega is also moving into the world of rewritable CD-ROM burners.

Genuinely Interesting Software Dept.: I was more than a little amused when Broderbund released the entire archive of *Mad* magazine on seven CD-ROMs. Check out *www.totallymad.com.* I've always admired this publication, especially during the Kurtzman/Elder regime. I do have one suggestion for Broderbund. Go back to the publisher and license some of the other **offbeat titles** that nobody has ever heard of. During *Mad*'s earliest years there was a spin-off called ***Panic.*** It was almost identical to *Mad,* and only a few issues were ever released. Just a thought. PC

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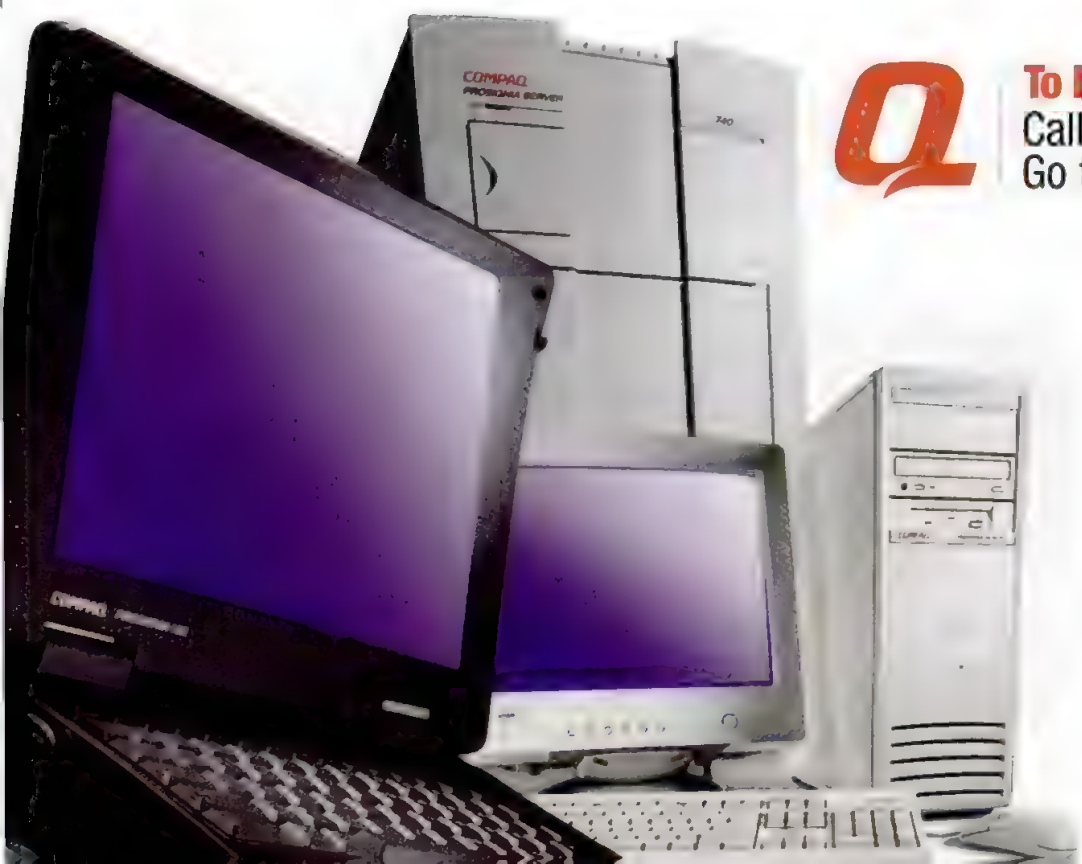

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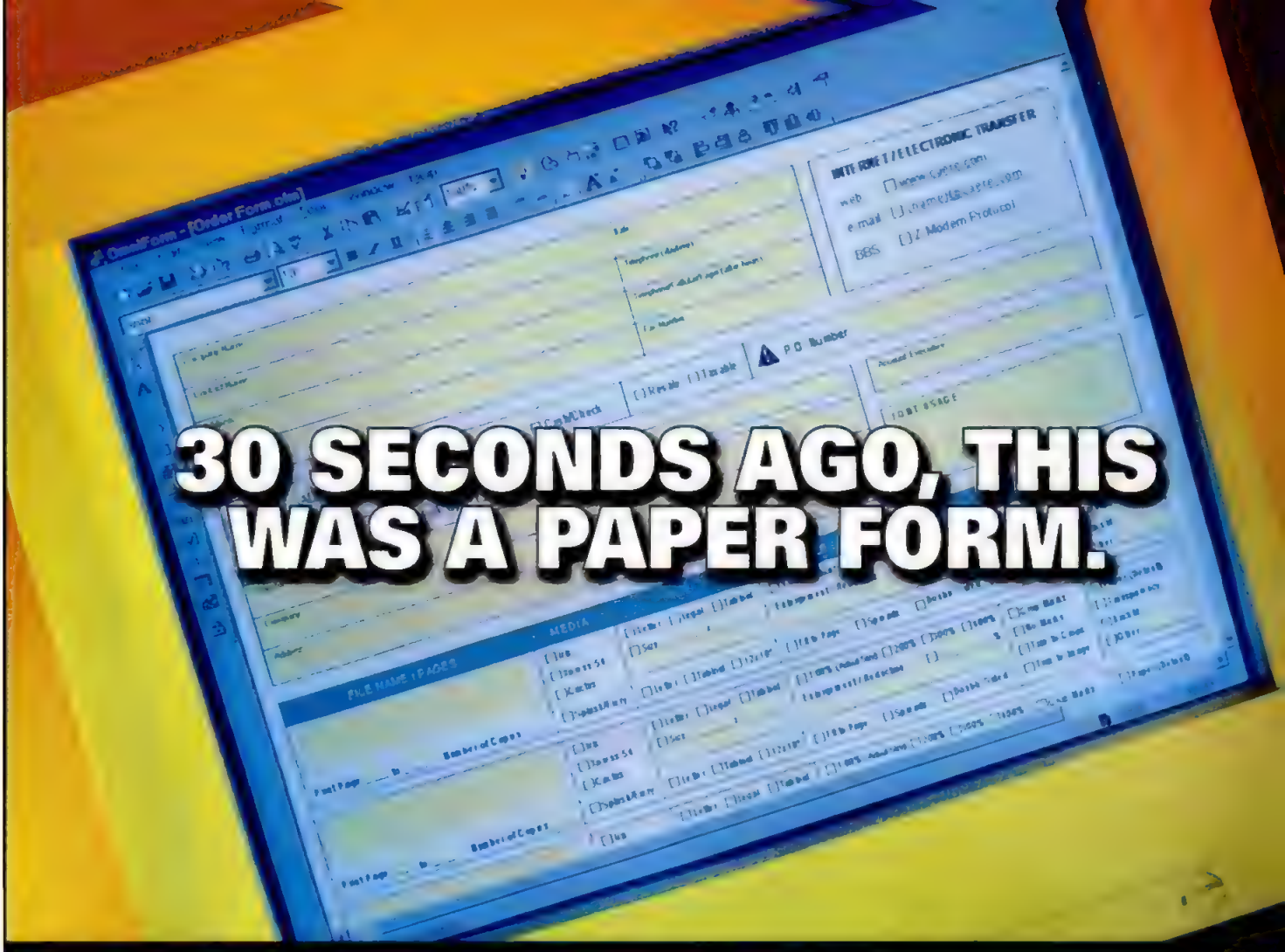

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Jim Seymour

The Home Network Problem

Becoming an expert means becoming a de facto consultant for friends and coworkers. That's as true for my friend the sports medicine doc and my cousin the airline pilot as it is for me, the Computer Guy. We do it more or less gracefully, from the "Will you take a look at this swollen ankle?" on the first tee to the after-midnight "My Web server crashed again" phone calls. And over time we develop what we hope are reasonably consistent, satisfactory answers.

I get questions almost every day now about home networking. No surprise there: Multi-PC homes are common, and people want to share their broadband connections. Until recently I had good answers, along the lines of "Use Cat 5 UTP wiring pulled to wherever you think you'll want a PC or a printer. Stay with 10 Mbps; you don't need more speed. Buy name-brand NICs and hubs. Good luck!"

But the home networking business is changing rapidly, and my mantra no longer holds. I'm never sure what to tell my friends and family when they ask for home networking answers, because the ground is shifting under our feet. Worse, many of the answers I want to give are contradictory. One result is that now these informal consultations have turned from phone calls or hallway chats into "Let's get lunch—there are lots of issues here that we need to discuss before you buy anything."

First, my biggest bias: You want a wireless network in your home. The convenience of being able to take a notebook almost anywhere is overwhelming. And it's worth sacrificing some speed for, if need be. I love Symphony, Proxim's simple, inexpensive wireless LAN system (*www.proxim.com*), and have recommended it hundreds of times to others. I also really like the Lucent WaveLAN system (*www.wavelan.com*), now in its second major version; it's speedier and more robust, but a lot more expensive than Proxim's answer. (No, of course they're not compatible.)

But it's not that simple anymore. In fact, I've come to an analytical model of planning and bringing up home networks that focuses on five axes: convenience (wireless versus wired), performance (10-Mbps and maybe 100-Mbps wired speeds versus the 1.5- to 2-Mbps speeds of most wireless LANs), economy (wired is always cheaper if you do the work yourself but incurs a great cost in terms of convenience), upgradability (pull the right wire to the right places and the inevitable upgrades will be cheaper and maybe easier), and security (with always-on Internet connections via cable modems and ADSL lines, don't ignore security issues).

I could write a book on these conflicting goals—and maybe I will—but let me try to distill the basic ideas, and my conflicts, down to one column.

Convenience. Wireless is quick and relatively easy to install. But performance suffers, and it isn't the cheapest answer. Worse, we're about to see a big move from today's relatively slow wireless Ethernet systems to faster ones, typically delivering something close to 10 Mbps. And new standards promise the kind of interoperability between systems that allows the mixing and matching of wireless-LAN hardware. (Forgive me, but I'll believe that when I see it running in my home.) So buying today may be risky.

Performance. Pulling Cat 5 wiring allows you to bypass the issue of 10 Mbps versus 10/100 Mbps: Going to 10/100 becomes a no-brainer with today's affordable Fast Ethernet hubs and switches, such as the superb D-Link DFE-910 Network in a Box ($100 street, *www.dlink.com*), which includes a five-port 10/100 switching hub and two 32-bit PCI NICs. But go for maximum performance and you're squarely in a wired world—and if you're a notebook user, you'll soon hate that.

Economy. If wire pulling is easy in your home's walls and floor-to-floor, you can't beat products such as the D-Link kit and competitive kits from Linksys and Netgear, my other two favorite low-price network product vendors. Easy to install, cheap, lots of speed—I could go on and on. But wire pulling in homes and apartments is rarely easy and is often impossible. Back to square one.

Upgradability. I figure anything I put in today will be replaced in a couple of years. But if a long-lived home LAN is an issue for you and you can get wire into the walls, that will make upgrading easier. With wireless networks, upgrading means throwing everything out and starting over.

Wireless is quick and relatively easy to install. But performance suffers, and it isn't the cheapest answer.

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Jim Seymour

Security. This is the one that trips up a lot of would-be home networkers. It's so easy to get hacked with a cable modem connection that you really should have some kind of firewall on any home network using broadband access from a cable company. The problems aren't as severe with DSL connections from the phone company, but they still exist. The best firewall product I know for home use—and one of the most satisfactory computer products I've ever used—is the BeadleNet SOHO 2000 hub/router/firewall (reviewed in First Looks, September 21, 1999). You can buy it for around $400, and you won't regret it. But it's still a 10-Mbps device, and of course it's wired, so you forsake speed *and* convenience.

So what do you do? Punt? Maybe. For a few months. But I hate that answer. My four current, not-entirely-satisfactory answers:

- For economy, look at the phone-line systems coming to market from AT&T, Compaq, D-Link, IBM, Intel, 3Com, and others. These can often use your existing phone wiring. At just 1 Mbps or so, these first-generation products aren't speed demons, but the Home Phoneline Networking Association has been promising industry agreement on a new 10-Mbps standard by the end of the year.
- More generally, I say go wireless with today's Symphony system, or wait just a little longer for the faster, industry-standard products coming in a few months from Lucent, Proxim, and others.
- For maximum performance? Pull Cat 5 wire and go straight to a fast, cheap 10/100 Fast Ethernet system.
- For security? Go bare, or insert a BeadleNet unit in either of the first two kinds of systems. Or use a software firewall, less robust but probably good enough.

See what I mean? There are no good, straight-ahead answers available today, ones that cover all the bases.

We'll see an explosion in home networking in the new year, and I expect to be able to write a very different column a year from now. So keep reading—and in the meantime, struggle, as I do, when your friends start asking about home networking.

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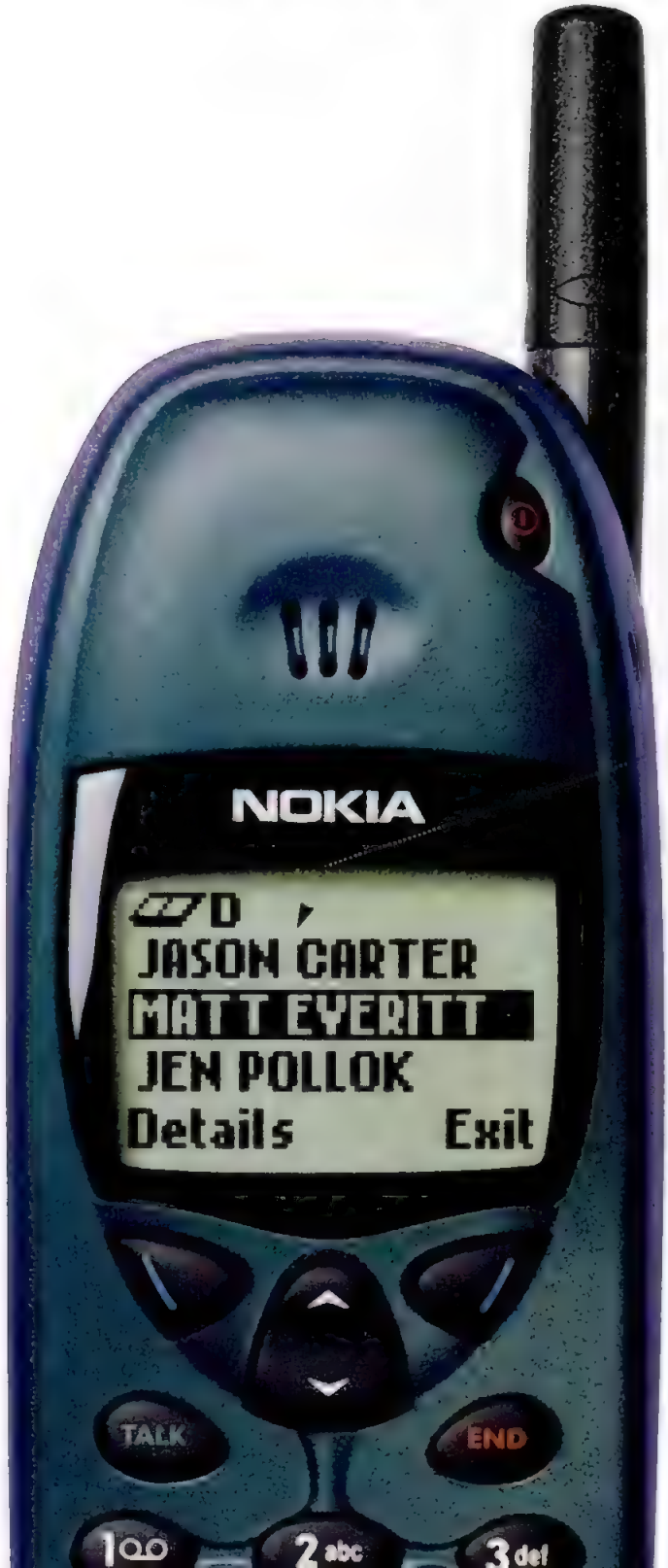

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Bill Howard

In Praise of the C-Word

There's that C-word again: *convergence*, as in *digital convergence*. The word is almost as bad and overused as *information superhighway*, except Al Gore doesn't recall inventing convergence—yet. I hate the C-word and love the concept: Your computer, your stereo gear, your cell phone, your PDA, and your telephone are going to start looking like and working with each other.

In the audio/video realm alone, I can think of at least six examples of AV/PC convergence unfolding by the end of 2000.

1. Hard disk appliances will replace CD changers. You can do it now (it's a bit geeky), and within a year, they'll be commercial products. More below.

2. Hard disk VCRs will replace VHS VCRs. The TiVo and ReplayTV are out already: The interfaces are okay, the picture quality is good, and the promise is superb.

3. DVDs will link the PC and the AV rack. If you watch one rental tape a month, you owe it to yourself to switch from a VCR to a DVD player. The picture quality is incredible; there are 3,000-plus DVDs available, and decent players are sub-$300.

4. Game consoles will become Web browsers. The next generation, especially the Sony PlayStation 2, will have DVD drives and Internet connections. This could be your DVD player—and with a keyboard, you'll have a Web-browsing PC.

5. Your PC will be equipped with a TV tuner. With a TV-tuner-equipped PC, you could watch a cable news channel or a soap opera in a small window. The PC could watch the closed-captioning text stream and record to disk anything matching your keyword list. With buffering, it could retain, say, the 3 minutes before the match and 10 minutes after.

6. You'll be able to edit videos on your PC. If you get a DV or Digital8 video camera, which has an HPSB (High-Performance Serial Bus—a.k.a. FireWire, IEEE 1394, or i.Link), you can edit on your PC with no quality loss.

The hard disk CD player has me most enthused. My 15-year time line of CD-player ownership runs from a 1-disk player to a 5-disk changer to a 200-disk changer to the 300-disk changer I almost bought. Each solved one problem and created another.

My next player will probably be a return to the single disk—a 20GB to 30GB hard disk that holds compressed digital music and thinks it's a computer. Hard disk makers, network-attached storage vendors, and traditional audio companies are scrambling to make this happen within the next year.

You can do it yourself today, if you want. Take a cheap PC; stuff in the biggest hard disk you can find; add a decent sound card, a CD-ROM drive, a modem and Internet connection, and MP3 player software such as MusicMatch Jukebox (*www.musicmatch.com*) or Real Networks' RealJukebox (*www.real.com*). One at a time, stick each audio CD you own in the PC. The music software does three things: It converts the CD into compressed MP3 files on your PC. It finds the CD title, song titles, sometimes the lyrics, and the musical genre online, usually at CDDB (*www.cddb.com*). Only a handful of audio CDs have that info encoded. And the software helps you set up playlists. Encoding at 96 Kbps is fine for background listening, but if you have good ears, you might want to try 128 Kbps or even 256 Kbps.

The integrated product will likely have a CD drive built in, so it will be able to process the audio tracks without turning to a PC. There will be audio-out jacks to your stereo receiver. There will have to be either a PC connection (Ethernet, LAN, or USB) or a keyboard jack, so you can fine-tune your playlists. Some makers envision encoding at 256 Kbps; then you'd be able to downsample and offload to a personal MP3 player.

With a high-speed cable modem or DSL connection, your hard disk jukebox could go get more music similar to what you already have and like. It appears that the SDMI copy-limiting schemes won't be so tight that you won't be able to make personal copies for portable or car players. (MP3 jukeboxes for the car are coming.)

To get more finely tuned music now, buy a CD changer with a keyboard jack, not just a rotary dial for entering song info. If you want music the way you like it without the repetition inherent in even 300-disk changers, look into the audio channels available with premium cable or satellite TV. Or do what my wife suggests: Flip on the FM radio. PC

The next genertion of game consoles, especially the Sony PlayStation 2, will have DVD drives and Web connections.

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Our Contributors: ALAN COHEN and DAVID KUSHNER are freelance writers. MATTHEW GRAVEN is an associate editor at ZDNet. SHERYL CANTER is a contributing editor, and SARAH PIKE is a copy editor at *PC Magazine*. Senior associate editor DAVID LIDSKY and PC Magazine Labs senior project leader JAY MUNRO were in charge of this story.

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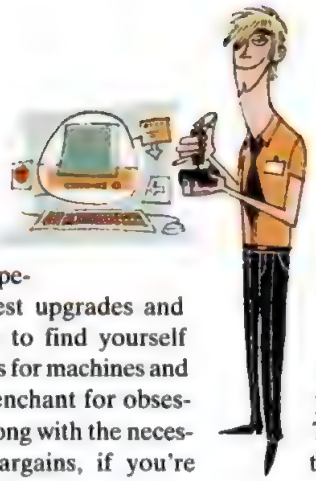

Hardware is increasingly hard to buy. Unless you have an encyclopedic knowledge of the latest upgrades and innovations, you're liable to find yourself swimming in picayune specs for machines and peripherals. The Web's penchant for obsessive details can help you along with the necessary product info and bargains, if you're already a savvy shopper.

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Our favorite hardware site is **Outpost.com** (*www.outpost.com*), one of the few hardware commerce sites that really seems to get the importance of putting all key information within a click's reach. Its excellent interface offers order tracking, customer service, and shopping cart buttons right on the home page and, even better, at the top of the home page for easy, nonscroll access.

There are deals to be had, too. Outpost.com offers some of the most competitive prices on the market. The Epson Stylus Color 740, for example, runs $149.95, $50 cheaper than at the most expensive merchant, **PC Zone** (*www.zones.com*). And Outpost.com doesn't try to get a little extra out of you in shipping costs—many items come with free overnight delivery.

Of course, there's always room for improvement and when it comes to building your own new desktop computer, even top sites like Outpost.com and **NECX** (*www.necx.com*) offer little in the way of do-it-yourself help. NECX, in fact, simply links you directly to the Gateway site for customizable PCs. (For more on online computer shopping, see "Buy Direct: Ordering PCs from the Manufacturers Is Easy," later in this story.)

All of the notable hardware sites offer a range of search tools. **Micro Warehouse** (*www.warehouse.com*) offers a pull-down menu of criteria, including product name, item number and specifications, and manufacturer part number, but no explanation of how one might embark on a search without those details in hand. NECX goes a step farther, with a Java-based power search applet that lets you narrow down your choice by processor speed, bus speed, price, and manufacturer.

For the educated consumer, this is a great way to cut to the chase. NECX also does one of the best jobs of offering outside reviews from major sources such as CNET and ZDNet. But it would benefit, as would other services, from creating a simple, how-to-buy-a-desktop section within the navigation. NECX could also improve its customer service. Its confirmation e-mails lacked basics such as order tracking information and an itemization of our order.

Other sites offer interesting tools for other aspects of the selection process. **Buy.com** (*www.buycomp.com*) has a built-in price comparison program that gives you accurate and up-to-date looks at going rates on up to three competitors' sites, taking the legwork out of finding the best deal. You should still check out the competition on your own, maybe using a shopping bot (see "Shopping Bots," later in this story); you'll find dozens of hardware vendors on the Web, and Buy.com does not offer price comparison on every item it sells. You'll also find that Buy.com offers little other than low prices—*not* even spec details on what it sells in some cases.

CDW (*www.cdw.com*) offers a unique tool for

Editors' Choice

PC MAGAZINE EDITORS' CHOICE

Hardware: Outpost.com In its ads, Outpost.com may shoot gerbils out of cannons and sic wolves on high-school marching bands, but no one gets hurt buying hardware there. A clean, well-organized site with low prices and free overnight delivery on many items, Outpost.com is a great site to visit when you're shopping for your next printer, scanner, or digital camera. Its True Price notably lets you know your total cost right up front.

Software: Chumbo.com We don't know what Chumbo really means, but to us, it means the place to buy software online. The easy-to-navigate tabbed interface makes it a breeze to find exactly what you want by browsing. Posted reviews from users and ZDNet give it a very appealing sense of community, and the excellent downloadable software section points users towards the future.

Books, Music, Toys: Amazon.com When you're good, you're good. Amazon.com gets the Editors' Choice hat trick, delivering an unmatched online shopping experience, whether it's Stephen King, Coltrane, or Pokémon that you're after. Its community features still cannot be rivaled, and Amazon.com's rigorous attention to customer service gives it the edge over sites like barnesandnoble.com, CDNow, and eToys, which may have more bells and whistles but can't execute the basics as elegantly as Amazon.com does.

Megasites: Netmarket Real-world superstores usually have all the charm of the warehouses they once were. Netmarket does much better than that, offering all the essentials—great prices and special deals for members on a wide variety of merchandise, comparison tools, and effective cross-selling—within an effective and pleasant interface.

Shopping Bots: mySimon Meet Simon, your new best friend on the Internet. mySimon helps you search more than 1,500 online merchants in scores of shopping categories to find out where to shop and to clue you in on who's got the best deals. No other shopping bot offers its breadth or depth, and mySimon's context-sensitive search within any particular category helps eliminate junk from your search returns. Name another friend who'll do that for you.

Auctions: eBay You've heard it all before: eBay is the world's largest garage sale, the Web's trading post, the marketplace of the future...and it's all true. Like Amazon.com in books, music, and toys, eBay may not have all the fancy tools that some of its competitors offer, but no other site brings together as many people bidding on as many items at any one time. Its stunning array of millions of products means that you're almost sure to find what you want—then you have to determine what it's worth to you.

finding the right product on its site. Each product page includes a small price-comparison window, giving information on other similar products available on the site. So you immediately see, for example, that a Canon MultiPass C635, at $379, is only $10 more than the MultiPass C5500. Another comparison tool lets you compare up to five similar products in categories such as desktops, monitors, and scanners. CDW just can't compete with Outpost.com on price, especially its free overnight shipping.

The established catalog dealers like PC Zone and Micro Warehouse do little to sway you from making your purchase over the phone—where you might be able to haggle with a carbon-based sales representative. Their messy, confusing interfaces—crammed with tiny pictures of products and full of hyperbolic sales ads—emulate their print catalogs, which are not very Web friendly.

Overall, our readers give the nod to NECX for its selection and price. See "Readers Rate the Web," (page 125).

No hardware site has followed the lead of sites like Amazon.com; community features are painfully lacking on all fronts. With the limited guidance these sites offer, the least they could do is give consumers a way to find some real live human help, namely, one another.—*David Kushner*

[SOFTWARE]

If there's a perfect product for e-commerce, it's software. Being able to try before you buy and the instant gratification of downloading make software a natural.

One of the primary issues is price. **Buy.com** (*www.buysoft.com*) is the most aggressive competitor, often delivering the best deal and even going so far as to offer a low price guarantee for seven days after purchase. A hot program like Mijenix's Fix-It Utilities 99, for example, clocked in at $33 at Buy.com, versus $44 at **Beyond.com** (*www.beyond.com*), the most expensive of the retailers here.

With thousands of software titles available, one of the most important qualifications for a site is a good interface. **Chumbo.com** (*www.chumbo.com*), our Editors' Choice winner for the second year in a row, leads the pack with its bold top-ten list on the home page and clear breakdown of popular categories, including education/home, multimedia, programming/OS, business, entertainment and utilities; each category is broken down by several other categories once you arrive at those sections. All it lacks is a swift pull-down menu, like Buy.com's, which lets you quickly and easily search by category.

CompUSANet (*www.compusanet.com*) is a suitable example of how *not* to organize a software site. Some of the most important information on customer service and return policies is buried within the site and almost impossible to find; there isn't even a sensible FAQ. Shoppers at **Egghead.com** (*www.egghead.com*) suffer a similar problem—an overwhelming homepage with ugly product pictures when what's really needed is a step-by-step orientation through the e-commerce process.

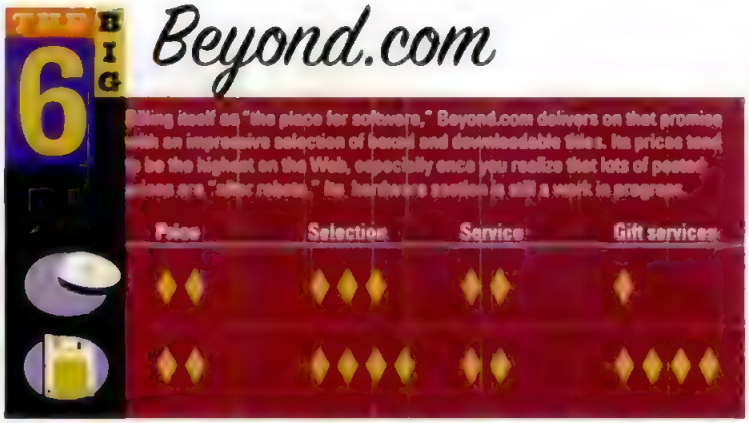
Ultimately, because anyone could buy most of the same products off-line, the main purpose of the software sites is to make the mission quick, inexpensive, and painless. One distinct advantage—one that, in fact, puts software sites at the forefront of e-commerce—is electronic delivery.

Beyond.com, Chumbo, and, surprisingly, CompUSANet have the best digital download features. One application of this service is that customers can try out software before purchasing it. You can, for example, download WebEdit Pro 3.0 on a seven-day trial basis and then pay $77.80 if you want to keep it.

If this sounds a lot like shareware, it should; the products are often the same ones you can try out elsewhere on the Web. Beyond.com's Download Center offers the best selection of utility, games, graphics, and Internet downloads but does include some regular software like Norton

CHECK OUT the spotlights on the six largest e-commerce sites, according to Media Metrix, that sell across multiple categories. The icons identify the types of goods that each site offers: hardware, software, books, music, videos, toys, electronics, and auctions. Four diamonds represent the best rating.

BOOKS
MUSIC
VIDEO
TOYS
ELECTRONICS
AUCTIONS



AntiVirus 2000. Fat programs like Microsoft Office 2000 are currently too bulky—and too expensive—for the electronic trip.

Finally, for software sites to really take off, they need to adopt the community model best exemplified by sites like Amazon.com. Only Chumbo seems to embrace user reviews at this point. There are also links to professional reviews, including many from ZDNet. Beyond.com lags behind Chumbo when it comes to reviews and customer comments; as a result, the site doesn't provide as qualified a buying experience. And for buyers who might be shopping without knowing exactly what they desire, there's nothing better than a little tip from a passerby. Or, in this case, a surfer.—*DK*

[BOOKS] For all their high-tech wizardry, the best book-selling sites can be downright old-fashioned. Customer service, recommended reading lists, easy access to titles new, old, and obscure—you'll have to supply your own coffee and armchairs though.

At the head of the pack is **Amazon.com** (*www.amazon.com*). The selection is vast, the shipping prompt, and the support unrivaled. We like **barnesandnoble.com** (*www.bn.com*) too, though its customer service is not quite up to Amazon.com's standards. Our readers tell us they prefer Amazon.com over its competitors in every aspect judged from product selection and price to ease of navigation and customer support. (See "Readers Rate the Web," page 125.)

A pleasant surprise was **Borders.com** (*www.borders.com*). The site doesn't yet have all the bells and whistles you'll find at Amazon.com or bn.com—there aren't any links to related books, for example, and there are far fewer customer reviews—but our books arrived promptly, as did helpful replies to our e-mail inquiries.

All three of these sites offer easy navigation and comparable discounts. But each has its own nice touches. Borders.com posts staff recommendations and lets you return books to any of its physical stores. Amazon.com and bn.com feature handy one-click shopping: Press a button and the book is instantly ordered. Amazon.com also lets you create a Save for Later list—a wish list for future purchases. The excellent search engine at bn.com enables you to look for, say, paperbacks or audio books only.

All three sites have liberal return policies (send any book back for a refund), but Amazon.com and Borders.com get the nod for customer service. We ordered the same five titles from each site. All immediately sent us an e-mail confirming the order. We then wrote to each vendor saying we had ordered one title in error, and we asked to cancel it.

Borders.com sent back a prompt, personalized reply saying the cancellation was taken care of. Amazon.com also replied promptly, telling us the title was already in the shipping process and could not be canceled; since it was being sent as a gift and would be inconvenient to return, Amazon.com would credit us the cost, and the recipient could keep the book anyway. (Nice!) There was no response from bn.com, which just sent us the title (very promptly).

We also ordered the same five books from **Buy.com** (*www.buybooks.com*), encouraged by prices that often fell below those of the big three. According to Buy.com, all these titles usually ship within 24 to 48 hours. Key word: *usually*. Three days after placing our order, we got a note saying that four of the five titles were back-ordered and that we had the option of canceling.

We called customer service, asked to cancel the order, and were told it was deleted. Two days later, another e-mail arrived, telling us the books had been shipped. A second call to customer service revealed that our cancellation had been declined and that we would have to call again when the books arrived, get an RMA number, and ship everything back for what we were told would be a full refund, including shipping costs. Worse: When the books did arrive, there was no packing material in the box, and one book looked like it had been used for batting practice.

One other site warrants mention: **Wal-Mart Online** (*www.wal-mart.com*). The selection is limited and the interface spartan, but paperbacks are discounted 25 percent (compared with the typical 20 percent), and your shopping cart is on-screen at all times, complete with a total that includes shipping and tax. Speaking of shipping, Wal-Mart only charges $3 per order, no matter how many titles you order. That's quite a deal, considering that it cost Wal-Mart $3.55 to send our books. The wonders of e-commerce.—*Alan Cohen*

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- McAfee VirusScan 4.02
- Microsoft Windows 98, Second Edition
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- 3-Year Limited Warranty[2]
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- Dell System Mouse
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- 15" (13.8" vis) M570 Monitor
- 4MB ATI PRO 2X AGP Graphics
- 24X Max[7] Variable Slimline CD-ROM
- 3Com® Fast Etherlink™ XL 10/100MB NIC, Remote Manageablilty via DMI 2.0
- MS Windows NT Workstation 4.0
- Dell QuietKey® Keyboard
- Dell System Mouse
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- MS Windows NT Workstation 4.0
- Dell QuietKey® Keyboard
- Dell System Mouse
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- Lithium Ion Battery
- Microsoft Works Suite 99 with Money 99 Basic
- Microsoft Windows 98 Second Edition
- 3-Year Limited Warranty[2]
- McAfee VirusScan 4.02

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DELL NOTEBOOK AWARD INFORMATION

- Dell Portables Rank #1in TBR's Customer Satisfaction Survey, Q2/99
- *PC World's* 1999 Service & Reliability Award from Customer Survey.
- Inspiron 3500 C366XT – *PC World's* Best Buy in the budget category, 9/99.
- Latitude CPt C400 GT – *PC Magazine's* Editors' Choice Award, 8/99.
- Latitude CPi A366XT – *PC World's* #1 Best Buy Power Notebook, 6/99,7/99.
- Latitude CPi Series A366XT– May *Windows Magazine* List Fastest Performance,5/99, 7/99.
- Latitude CPi Series A366XT – 5-Time Survivor of *PC Computing's* Annual Torture Test, 3/99.

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- Modular Floppy Drive
- MagicMedia™ 256ZX
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- Lithium Ion Battery with 1-Hour ExpressCharge™ Technology
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- 3-Year NBD On-site[3] Service

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- Modular Floppy Drive
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- Lithium Ion Battery with 1-Hour ExpressCharge™ Technology
- Microsoft® Windows NT® Workstation 4.0
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★ *Add a 24X Max[7] Variable CD-ROM, add $99*
★ *Upgrade to High Capacity 8 Cell Li-Ion Battery, add $49*

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Business Lease[15]: $100/Mo., 36 Mos

E•VALUE CODE: 04187-791029

DELL® LATITUDE® CPt

Network-Optimized Notebook

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- 32MB SDRAM (512MB Max[13])
- 4.8GB[4] Ultra ATA Hard Drive
- Modular 24X Max[7] Variable CD-ROM
- Modular Floppy Drive
- MagicMedia 256ZX
- 3D Surround Sound with Wavetable
- Lithium Ion Battery with 1-Hour ExpressCharge™ Technology
- Microsoft® Windows NT® Workstation 4.0
- 1-Year NBD On-site[3] Service

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★ *Please contact your sales representative for more information as estimated ship dates are not available*

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Business Lease[15]: $64/Mo., 36 Mos.

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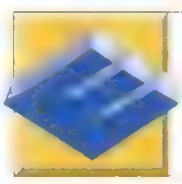

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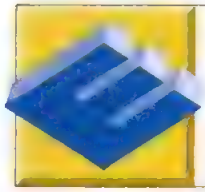

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(DUAL PROCESSOR/RAID CAPABLE)

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- 64MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- 9GB[4] (7200 RPM) Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- 40X Max[5] Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
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Entry-Level Server

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- 64MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
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- 40X Max® Variable EIDE CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated PCI Ultra-2/LVD SCSI Controller
- 6 Expansion Slots: 5 PCI, 1 PCI/ISA
- 4 Hard Drive Bays: 2-1.6" and 2-1"
- 3-5.25" Media Bays
- 3-Year Next-Business-Day On-site[3] Service
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- *Network Computing*'s "50 Best Products of the Year" – Dell PowerEdge 6300 (Enterprise Server), 5/99.
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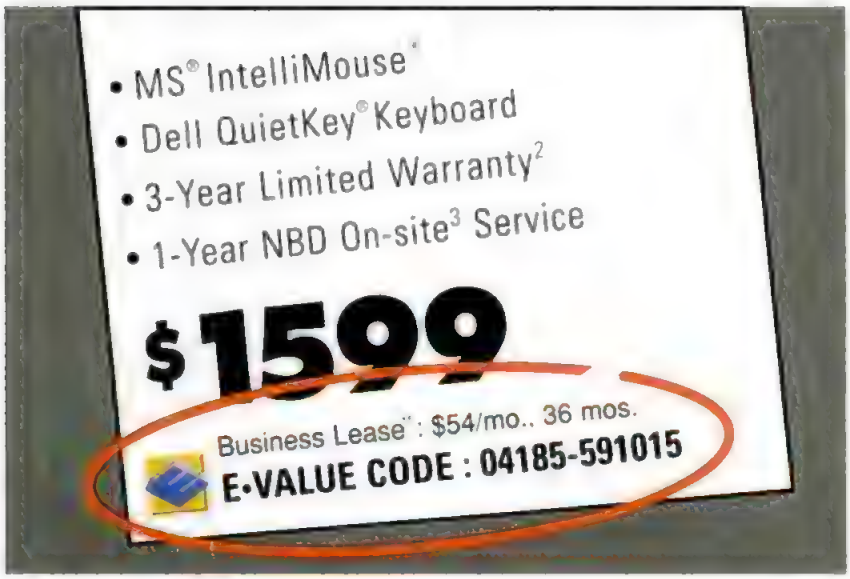

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[MUSIC] MP3 and other digital music may be popular and the wave of the future, but for the moment, buying CDs online continues to be one of the biggest trends in Internet shopping. And although CD shopping online may not provide instant gratification, it does offer many advantages over the record store—sample clips for almost every album, search engines that help you track down exactly what you're looking for, and huge selections that no physical store can rival.

The best overall CD buying experience came at **Amazon.com** (*www.amazon.com*), where the easy-to-navigate interface, useful tools for discovering new CDs, competitive prices, and fast order fulfillment won out over the bells and whistles of **CDNow** (*www.cdnow.com*). CDNow gives you more content on individual artists than Amazon.com does, as well as a gift registry, a favorite artists list, and custom CDs; but the actual buying process is not as smooth. CDNow's shopping cart and checkout process can be confusing, since it does things like automatically make the shipping address the primary address on the account.

Both Amazon.com and CDNow offer recommendations for albums you might like, but Amazon.com has integrated the information into every album detail page, so it is always accessible. CDNow includes recommendations in a separate area of the site, where they're easy to forget about.

For the most part, the price per individual CD didn't vary greatly from one site to another, although we found that **barnesandnoble.com** (*www.bn.com*) seems to offer low prices most consistently. Online prices are relatively cheap compared with those at physical stores—approximately $12 per CD, versus $17. Only **Virgin Megastore** (*virginmega.com*) had prices as high as those you'll find in a typical record store.

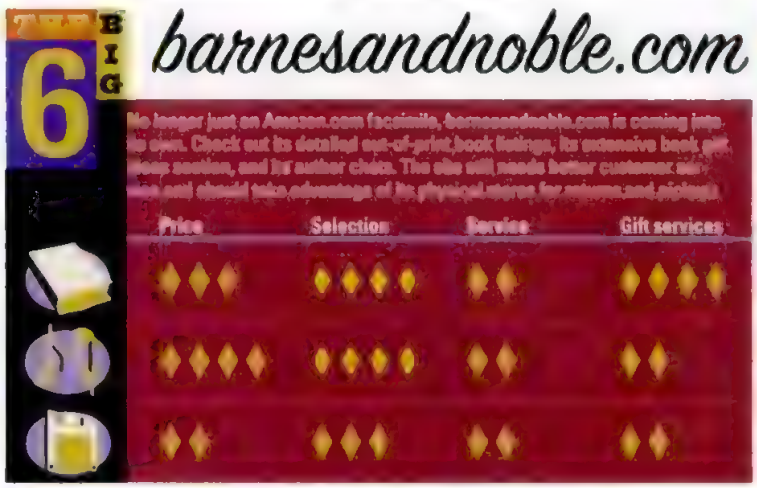
The key differentiating factor was not a particular feature but customer service. For example, some of the titles we searched for were out of stock at Amazon.com and CDNow. But Amazon.com got the back-ordered CDs to us faster than stores that said they had the CDs in stock did. In our reader survey story, "Readers Rate the Web," readers also told us they prefer Amazon.com overall.

Buying CDs online presents options that make it among the most sophisticated of e-commerce experiences. But make sure you pick a site that handles the fundamentals well, or the happy tune of your experience will turn sour.—*Matthew Graven*

Whether you are on your maiden e-commerce voyage or you're an old hand, Amazon.com delivers the best experience for buying books, music, or toys online.

[TOYS] If you've ever been in a toy store around the holidays or on any Saturday afternoon, you can see the appeal of buying online: no kids running up and down the aisles, no frantic parents fighting over this year's impossible-to-acquire "it" toy. Buying toys online alleviates those hassles and introduces some major advantages over the toy stores' real-world cousins: search engines; easy product grouping by age range, brand name, and category; gift shipping directly to a recipient; and larger, lower-priced inventories.

Bringing to bear the site features, deep inventory, and faultless customer service we've come to expect when buying books or music, **Amazon.com** (*www.amazon.com*) quickly became the standard by which we judged other toy sites. No one pays attention to the details the way this company does. Send an Amazon.com gift to your nephew and if he returns it, Amazon.com will credit him, not



you—a simple concept other toy stores would do well to imitate. **eToys** (*www.etoys.com*) is a strong number-two presence in this market, but its cluttered interface and lack of customer reviews leave it slightly lacking.

Gift services are essential when it comes to toy shopping, but only Amazon.com and eToys offer any. Both sites send beautifully wrapped gifts; eToys deserves kudos for letting you ship to multiple addresses per order as well as for its gift registries, kid wish lists, and event reminders, which ease your shopping even more.

Finding toys is easier online because of search engines, although your browsing experience isn't as satisfying. Using the Amazon.com Toys' excellent search tool, we found nine different Mr. Potato Heads but were unable to find him by browsing the site. Every toy site we reviewed could stand some improvement here. eToys' search returns had too many irrelevant hits; you could use a Mead notebook as a diary, but that's not exactly the point. **ToysRUs.com** (*www.toysrus.com*) breaks toys down into types—including subcategories, commendably—but the site won't let you browse according to age range.

Online toy shopping is an easy, attractive alternative to the masses—of toys and bellicose shoppers—you'll run into at your local toy emporium on any given day. At worst, you'll be subject to the same inventory vagaries as in the real world. But you'll never get stuck in a line, not even at this time of year.—*Sarah Pike*

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[MEGASITES]

America has long been the land of mall rats. But consumer culture has never reached a frenzy quite like the one fueling the current superstore mania. Retailers from Costco to Target have popularized the all-in-one shopping experience; instead of schlepping around town for different items, you get everything under one roof.

Not surprisingly, industrious Web sites are trying to create department store wonderlands online. The question is: Why would we use 'em? Isn't the Net all about niche culture and commerce?

The answer: Convenience. The best Net superstore, **Netmarket** (*www.netmarket.com*), understands the primal needs of Web shoppers—a breed of consumers who are looking to save time *and* money. Netmarket not only offers all the necessary bargains; more important, it offers A-list versions of all the necessary shopping tools, such as detailed, department-specific search engines and one-click product comparisons.

Value America (*www.valueamerica.com*) is Netmarket's closest online competitor, offering a good selection of products but lacking Netmarket's slick interface and shopping tools. Both sites have membership clubs resembling the ones their real-world counterparts offer (Wal-Mart's Sam's Club, for example). Value America does not charge for membership, but Netmarket does: $1 for three trial months and $69.95 a year thereafter. Netmarket offers much more in the way of member benefits, however, including up to 15 percent off its nearly one million products versus Value America's discount of less than 5 percent.

Low prices are certainly a major consideration at these megasites. We found that Netmarket most consistently had the best deals, especially for members. A Century infant car seat, for example, was priced at $52 for members and $62 for guests; at **Wal-Mart Online** (*www.wal-mart.com*), the same seat will cost you $69.96, no matter who you are.

Netmarket is also one of the savviest cross-sellers and up-sellers in the game, making you want to buy all your stuff in one place because the site makes it so easy. Sites like **Amazon.com** (*www.amazon.com*) simply suggest items that were purchased by others who bought your particular product. Netmarket goes a step further by offering attractively priced combos. Car stereo shoppers, for example, will most likely need a receiver and speakers; Netmarket wisely offers a variety of such package deals.

The online versions of traditional superstores

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service and no frills. Customer service is friendly and responsive, but we still had a number of problems getting products when promised

Price	Selection	Service	Gift services
♦♦♦♦	♦♦♦	♦♦	N/A
♦♦♦♦	♦♦	♦♦	N/A
♦♦♦♦	♦♦	♦♦	N/A
♦♦♦♦	♦♦♦	♦♦	N/A
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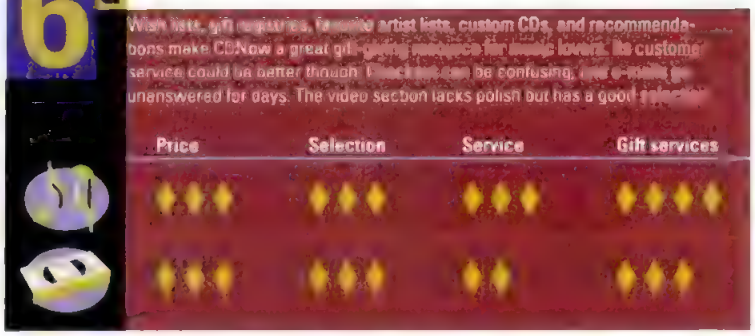

Costco (**Costco Online**; *www.costco.com*) and Wal-Mart could benefit from similar services. Both sites' best attribute is a clean, bold interface, which makes it easy to move throughout the site and see detailed product photos. You don't need a Costco membership to buy from Costco Online, but the prices aren't as impressive as those you'll find at one of its warehouses either.

In our story "Readers Rate the Web"(page 125), the surprise megastore winner is home shopping giant QVC's iQVC. Our readers like its customer service compared with Value America's.

Overall, however, the Net's megasites do not yet offer all the mundane but necessary products like diapers and lawn bags that make the bricks-and-mortar warehouse clubs popular. We hope it's only a matter of time.—*DK*

[BOTS]

Web shopping should be quick and easy, but with so many online merchants, finding which sites carry what you want and at what price can take a lot of time and work. Web shopping "bots" (short for *robots*), small programs that search e-commerce sites for low prices, can help.

mySimon makes it as easy as point and click to find where to buy almost anything on the Web—as well as the best deals.

The bot that scours the most e-commerce sites and generally delivers the best results is **mySimon** (*www.mysimon.com*). With more than 1,500 online merchants and millions of products, you can use mySimon for almost any product search and find out where to buy it and what you'll pay.

We tried to search for an Iomega Zip Drive (100MB ATAPI internal) at each bot we tested. mySimon found the lowest price ($69 at A2ZComputers) after searching 25 sites. **DealTime** (*www.dealtime.com*), with the smallest selection of merchants, did not have a category from which we could even search for Zip Drives.

The search options are the key to getting what you really want. On the same Iomega search, **BottomDollar** (*www.bottomdollar.com*), which claimed to search 31 computer stores, had the worst selection in its results, because it forces you to do a plain keyword search in almost every category. Each additional word you enter brings more junk into your returns.

DealTime helps you home in on your quarry with drop-down pick boxes that you can supplement with keywords. This is similar to the way mySimon works, but DealTime tends to offer more options within a particular category.

DealTime has other innovative features, such as the ability to save your search criteria and get e-mail or pager updates. Unfortunately, DealTime only searches about 500 online stores, auctions, and classified Web sites and is limited to categories like computers, software, electronics, sports, and home and garden items. mySimon, by contrast, has categories for everything, from apparel to vitamins, and many more merchants.

One of the best bots for browsing is **Yahoo! Shopping** (*shopping.yahoo.com*). Its database is large (all 6,000 Yahoo! Store merchants) and covers a diverse array of categories, and the site returns detailed product descriptions in its search results, as well as pictures (when available). Yahoo! Shopping doesn't let you sort the results list in any way. Sorting is an important tool that helps you screen out the inevitable junk that comes through with even in the best of bots. DealTime, **Excite Product Finder** (*jango.excite.com*), and mySimon all let you sort results by merchant, product, and price.

We reviewed general-purpose bots, but sometimes you may need a specialized tool for a particular task. If you're searching for computer equipment, for example, **computershopper.com** (*www.zdnet.com/computershopper*) and **CNET Shopper** (*www.shopper.com*) both provide huge amounts of up-to-date information on

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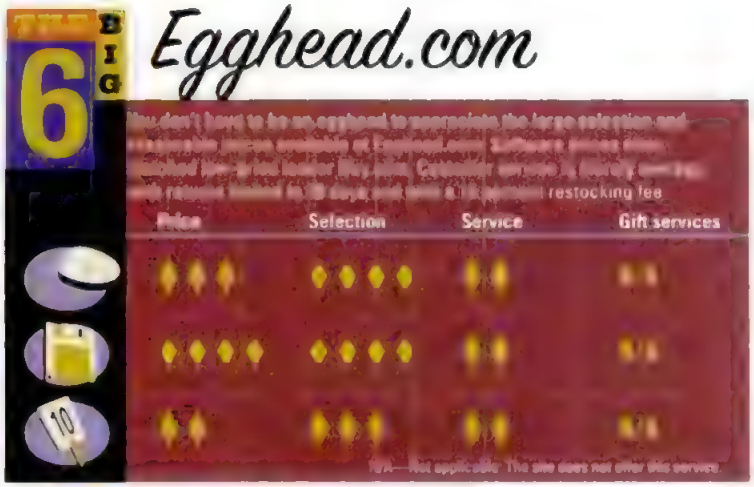

enormous selections of computer products.

The perfect bot does not yet exist. mySimon represents the best of the breed at this point. But as the number of e-commerce sites grows and bots become more essential, this emerging tool is sure to improve.—*Sheryl Canter*

[AUCTIONS]

Your friend or father or fill-in-the-blank is, in fact, the man who has everything. Or maybe you're the kind of person who can't buy anything unless you think you're getting a deal. No matter who you are, Web auctions provide the opportunity to find both everyday and once-in-a-lifetime items, often at excellent prices.

Person-to-person auctions provide the best opportunity to find almost any item you can imagine. The premier person-to-person auction site, is without question **eBay** (*www.ebay.com*). The name of the auction game is the number of items offered and bid traffic, and eBay is the undisputed king. eBay features more than 2.5 million items up for bid at any given time. **Yahoo! Auctions** (http://*auctions.yahoo.com*) is a distant second, with approximately 800,000 items up for bid. Readers overwhelmingly agree that eBay is number one overall, and Yahoo! also falls behind in bidding experience and customer support.(See "Readers Rate the Web," page 125.)

eBay's massive volume means that you have to be really picky not to find something that interests you, especially if you're looking for collectibles of any sort. But eBay works for those interested in more pedestrian items as well. We shopped for a laptop and had almost 5,000 to choose from at eBay, versus less than 700 on the new **FairMarket** auction network (*www.fairmarket.com*), which aggregates the auctions of CityAuction, Dell, Excite, Lycos, MSN, and others.

The selection at eBay can be overwhelming, though, and the site does not really offer enough tools to help you sift through everything. You can sort by the time auctions close in any particular results set, but you can't sort by bidding traffic or current price as you can at Yahoo! and **Amazon.com** (*www.amazon.com*).

You have to use the search engine at eBay to find what you want, because its categories are still too broad, bottoming out with a few thousand items for you to scan through. Yahoo! organizes its auctions the way it structures its Web directory, making it an easier experience for those who want to browse the site. Amazon.com, eBay, and Yahoo! Auctions all let you search within a category.

Amazon.com provides the best opportunity to "discover" auctions—sprinkling related auctions throughout its product detail pages, giving you the chance to turn a shopping trip into an auction experience. You're also preregistered to bid if you're already an Amazon.com customer, so getting started is a breeze.

Both Amazon.com and eBay have limited liability guarantees. In the event that you're ripped off, both companies protect you up to $250, but eBay has a $50 deductible. eBay is probably the safest place to bid overall, because its nearly five-year history means many users will have more extensive ratings that you can browse through to evaluate trustworthiness; the fledgling Amazon.com and Yahoo! auction sites have far fewer of these, since each is only about a year old. The only site that's recognized that you might buy gifts at auction is eBay. It has a gift-alert feature that lets a winning bidder send an e-mail to the person the present was purchased for, and then the winner arranges for delivery of the item as usual.—*David Lidsky*

The brick house of online auctions, eBay has created a community of buyers and sellers so large that you'll always find something to buy.

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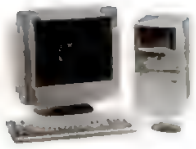

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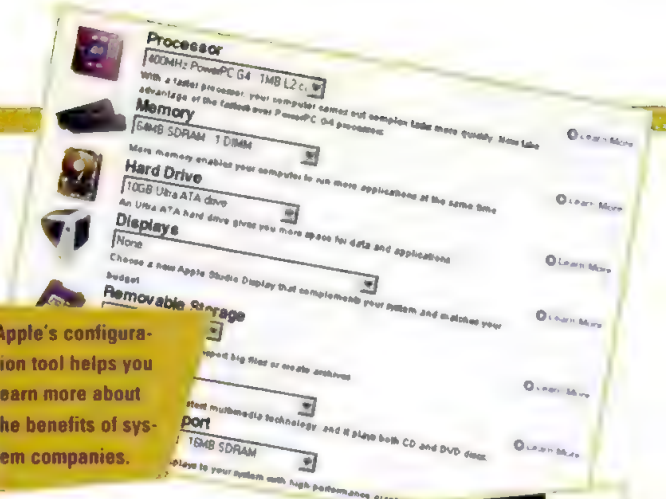
Ordering PCs from The Manufacturers Is Easy

Taking a page from the Dell playbook, most PC manufacturers now have a site where you can configure and order a system directly from the source. Many of these sites also offer services that the general-sales sites can't offer, such as machine-specific help, driver-update notification, and custom sites for large accounts.



ACER AMERICA
WWW.SHOPACER.COM

ShopAcer.com is a thoughtfully and attractively designed site. The site is true to Acer's target market of individual home and small-business buyers; you won't find customizable pages for volume customers. But the site developers have made it easy to find (or custom configure) a system that suits your needs and budget.

The home page highlights weekly specials, the Acer Rebate Center, and the ShopAcer Auctions at HotPCBuys, a fledgling auction site. The service options page and the Acer owners page each offer tips and downloads for your specific PC model.

APPLE COMPUTER
WWW.APPLE.COM

Apple has extended the design concepts behind its stunning series of PCs and notebooks to its Web site: Like the Apple iMac, Apple's site is intuitive and uncluttered, functional as well as fun. It's one of our favorites, hands down.

You can pick a preconfigured package or put together your own system. For each configurable component, there is a sentence that explains the component as well as a performance tip or an explanation of the technology. There's also a Learn More button that supplies more detailed information. Documentation on the Web site is excellent: Each product has a section with several drop-down menus that feed into the Tech Info Library and FAQs.

COMPAQ.COM
WWW.COMPAQ.COM

Since Compaq began selling machines direct, the company's Web site has become one of the leading places to buy. Our readers, too, like the site, giving it average marks overall (see "Readers Rate the Web" on page 125).

Compaq's primary sales site, DirectPlus, offers most of the company's leading business products, while separate subsites are available for home users, government users, or those amenable to refurbished or overstocked merchandise. As with most direct vendor sites, you can set up a personal account on the site, and all new systems can be custom configured. At any point, you can purchase the systems in your virtual shopping cart or merely save a record of the collection for later consideration. Leases, lines of credit, and customized Web pages are available for large customers. The company's support site offers new drivers, diagnostics utilities, manuals, and bug fixes.

DELL COMPUTER
WWW.DELL.COM

In many ways, Dell Computer Corp. began the recent revolution in online PC sales, and its Web site is still among the finest. Our readers agree, giving Dell above-average marks across the board among computer shopping sites on our survey.

The site's core is much as it's always been, letting you easily specify the system you want to buy (and easily buy it). Dell now offers several new services and new subsites as well. Detailed information on shipping, leasing, personalized Web pages (for large customers), and other services is always just a click away. What puts the Dell site a step ahead of much of the competition is what happens after a sale. Each machine arrives with its

The Dell site still offers the most robust custom configuration tool we've seen.

own Express Service Code, which when keyed into Dell's support site, provides a database of drivers, diagnostic utilities, manuals, and other files specific to that machine's hardware. Via Dell FileWatch, the site will even send you an e-mail when new drivers are available for your particular system. A separate Ask Dudley page gives you precise answers to questions concerning system problems.

GATEWAY.COM
WWW.GATEWAY.COM

After a significant redesign earlier this year, the Gateway Web site is almost as efficient and easy to use as competing sites from Dell and Micron. Like those on other sites, the Gateway.com's home page divides systems into several different buying categories (growing business, corporation, education, government, and so on) and links to a master technical support site. Our readers give the site above-average marks for ease of navigation and customer support and average marks everywhere else.

Throughout the step-by-step buying process, the site provides links to subsites dealing with refurbished systems and to Gateway.net, the company's ISP. Gateway's technical-support site doesn't quickly supply files or manuals specific to your system the way that Dell's and HP's sites do, but it provides an ample collection of drivers and technical documents, and the Technical Assistant wizard will help you diagnose and correct system problems.

HEWLETT-PACKARD
WWW.HP.COM

You can now purchase certain HP machines over the company's Web site. But we found purchasing through the site slow and fairly difficult relative to most other sites; where the Hewlett-Packard site stands out is in support. HP Customer Care, the company's support subsite, is eminently useful. After keying in the name of your machine or selecting it from an exhaustive list of HP products, the site posts a host of support tools specific to that machine, including drivers, software, setup tips, usage advice, and related manuals.

The HP Shopping Village offers new and refurbished products for homes, schools, and offices, while three other subsites sell business-related machines and software. As we write this, the Shopping Village and the HP Business Store won't let you custom configure systems, but this should change before the end of the year.

IBM CORP.
WWW.IBM.COM

IBM's direct-sales Web site doesn't offer quite the range of product that the Compaq, Dell, and Gateway sites do, but you can easily use it to buy home PCs, home notebooks, accessories, software, and even some server and some workstation models. Shopping online from IBM isn't as quick and easy as shopping online from Dell or Micron, and you can't custom- configure every PC offered.

IBM's technical-support site has improved of late, now letting you set up a personalized page that always offers files—including drivers, FAQs, news, and manuals—that are specific to your IBM product. Through this page, you can also make use of IBM's Knowledge Base, a wizardlike tool used for diagnosing and correcting system problems.

MICRONPC.COM
WWW.MICRONPC.COM

MicronPC.com is a shining example of what a direct-sales site should be. Dedicated to both selling PCs and supporting those PCs, the Micron site first asks what type of user you are (home, small business, and so on), and then simply and effectively directs you toward information on desktops, notebooks, servers, and associated services that may be of interest. MicronPC.com lets you custom configure a system and purchase it immediately, store price quotes, print configurations, or seek help with a purchase.

You can also access subsites to purchase peripherals and discounted systems, or—if you're buying a very large number of machines—arrange for a custom Web page that will meet your specific shopping and support needs. The site details Micron's ISP offerings, its installation and data migration services, and its trade-in polices, while serving up extensive support files, including driver updates, FAQs, manuals, bug fixes, and glossaries. The most impressive support tool may be Micron's new KnowledgeBase, which asks that you explain the problem your machine's been having, then lists possible solutions.

NEC
WWW.NEC.COM

NEC's product-comparison tool is robust: The checklist you can pick from is extensive, and the features checked are compiled into a chart for easy comparison. Systems are also customizable online through drop-down menus, and the price is updated automatically. Systems do not ship directly from NEC, but rather are routed through Insight, NEC's online reseller partner; alternatively, you can select another reseller from the available list. The support aspect of the site is fairly detailed. Software drivers, reference manuals, an FAQ section, and contact information are available.—*Mary E. Behr and Cade Metz*

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PC Week, February 1999

"Upgrading to Corel's WordPerfect Office 2000 is a **no-brainer** for WordPerfect users."

ComputerWorld, March 1999

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Readers Rate the Web

Everyone talks about e-commerce, but how many sites really deliver on their Web promises? And which ones provide the best e-commerce services?

At *PC Magazine*, we have several ways to find out. We can test the sites at our PC Magazine Labs, as we do for shopping sites in this issue. But often, the best evaluation of these services is made by their customers over time. So for this issue, we surveyed more than 4,000 *PC Magazine* subscribers to determine their overall satisfaction with e-commerce sites and their specific features.

We asked our readers which sites they use, and we ended up with statistically valid profiles for 58 of the most popular e-commerce sites, including 33 stores, 11 portals, 9 auction sites, and 5 online brokerages.

Not surprisingly, most of you are buying products over the Web regularly. Nearly half of our respondents bought computer equipment and books over the Web. One-third made music and video purchases.

Overall, our readers are pleased with the selection of products available online but less happy with the levels of customer support they experience. Which sites are the best for e-commerce? Read on.—*Michael J. Miller*

Visit us online to get the numbers behind the scores. www.pcmag.com

ILLUSTRATIONS BY MARK MATCHO

portal sites

- ✓ **A** Yahoo!
- **B** —
- **C** AltaVista, Excite, GO Network, HotBot, MSN.com, Netcenter, Snap.com, WebCrawler
- **D** AOL/AOL.com, Lycos
- **E** —

shopping sites

BOOKS

- ✓ **A** Amazon.com
- **B** —
- **C** barnesandnoble.com, Borders.com, Buy.com
- **D** —
- **E** —

MUSIC AND VIDEO

- ✓ **A** Amazon.com, Reel.com
- **B** CDNow
- **C** Buy.com, DVD Express, Tower Records
- **D** BMG Music Service
- **E** Columbia House

SUPERSTORES

- **A** —
- ✓ **B** iQVC
- **C** Netmarket, Shopping.com
- **D** Value America
- **E** —

COMPUTER HARDWARE AND SOFTWARE

- ✓ **A** Dell, NECX
- **B** Gateway, IBM
- **C** Beyond.com, Buy.com, CDW.com, Compaq, MicronPC, Onsale atCost, Warehouse.com
- **D** Egghead.com, PC Mall
- **E** CompUSA

OFFICE SUPPLIES

- **A** —
- **B** —
- **C** Office Depot, OfficeMax, Staples
- **D** —
- **E** —

auction sites

PERSON TO PERSON

- ✓ **A** eBay
- **B** —
- **C** Amazon.com Auctions, Excite Auctions
- **D** Yahoo! Auctions
- **E** —

MERCHANT

- **A** —
- ✓ **B** Onsale atAuction
- **C** Bid.com, DealDeal.com, Egghead.com Auctions, uBid
- **D** —
- **E** —

online brokerage sites

- **A** —
- ✓ **B** Charles Schwab, TD Waterhouse
- **C** DLJ*direct*, Fidelity
- **D** E*Trade
- **E** —

✓ denotes Readers' Choice

Web Site Satisfaction Survey

Portals

It's clear that there's no perfect model for a Web portal, but readers do demand quality.

ALL ANALYSES BY BEN Z. GOTTESMAN

THE TERM *WEB PORTAL* IMPLIES A doorway to all the wondrous bounty of the World Wide Web. Yet that's exactly what the sites calling themselves portals don't want to be. Most really want to be modern-day versions of the classic online services America Online, CompuServe, and Prodigy, providing you with everything in one place so you have no reason to go anywhere else.

If you accept the definition of a *portal* as a doorway to other places, then the 6 (of the 11 portals we surveyed) that started out as search engines—AltaVista, Excite, HotBot, Lycos, WebCrawler, and our Editors' Choice ("Web Portals," October 5, 1999) and Readers' Choice (here), Yahoo!—were truer portals then, not now. Over time, they have added content ranging from news to shopping, chat rooms, and small-business support in the hope that you will never have to leave their sites. But they're having a difficult time getting you to stay. Similarly, GO Network is Disney's conglomeration of its various Web properties, but most of those who access it still use it only as a launchpad to the Web via Infoseek, its search engine.

Overall, Yahoo! (which receives a grade of A on this survey) is clearly the most popular Web portal, used by nearly twice as many readers as runner-up AltaVista (C). In addition, Yahoo! scores above average on nearly all features. No other portal comes close. Yahoo! has also made one of the most successful transitions from search engine to Web portal. Only 65 percent of respondents report searching as Yahoo!'s most important feature, and 20 percent rely on it more for content. By contrast, more than 85 percent of AltaVista and HotBot users still consider the search features the most important aspect.

AOL continues to be an enigma. AOL and Lycos (both D grades) are the only two portals to receive below-average scores for overall satisfaction and likelihood to recommend. Yet AOL continues to command a very large percentage of the Web's users. In all probability, it's had the most success in packaging the Internet—providing access, a Web client, and valuable proprietary services. As a result, AOL has achieved what the others are striving for—stickiness. Only 20 percent of AOL users and visitors identify its search engine as the site's most important feature. Instead, users are visiting AOL for its content, applications, and community, all items that keep them returning to the site and staying for a while. In fact, AOL is the only site to average one visit per day by our respondents, although MSN is right behind it.

After AOL, MSN (C) and Netscape's Netcenter (C) are the runners-up in stickiness. Both sites benefit from being the default home pages in their companies' browsers. Although search is cited as one of the two most important features for the MSN and Netcenter portals, readers also make extensive use of the sites' content and applications. Readers also like the effort both sites have put into providing services for small companies, including tools for starting and managing a business and for using the Internet effectively.

e-STAT

portals

The most popular portals by years of user experience.

Less than one year on the Internet
Yahoo!, AOL, MSN

One to two years
Yahoo!, AltaVista, AOL

More than two years
Yahoo!, AltaVista, Excite

WEB PORTALS

	Grade	Percent of respondents	Overall satisfaction	Likelihood to recommend	Ease of navigation	Services offered	Integration	Personalization	Customer support	Web search	Content	Applications	Community	Shopping	Small business
AltaVista	C	14%	=	=	▲	=	▼	▼	=	=(1)	=(2)	▼	=	▼	=
AOL/AOL.com	D	9%	▼	▼	=	▲	▲	▲	=	▼	=(1)	=(2)	▲	=	=
Excite	C	11%	=	=	=	=	=	▲	=	=(1)	=(2)	=	=	=	=
GO Network	C	8%	=	=	=	=	=	=	=	=(1)	=(2)	=	=	=	=
HotBot	C	8%	=	=	=	=	▼	▼	=	=(1)	=(2)	▼	▼	▼	▼
Lycos	D	6%	▼	▼	=	=	=	▼	=	=(1)	=(2)	▼	=	=	=
MSN.com	C	8%	=	=	=	=	▲	▲	▲	▲(2)	▲(1)	▲	▲	▲	▲
Netcenter	C	6%	=	=	▲	▲	▲	▲	▲	=(1)	=(2)	▲	=	=	=
Snap.com	C	3%	=	=	=	=	=	▲	▲	=	=(1)	=(2)	=	=	=
WebCrawler	C	2%	=	=	=	=	▼	=	▼	=(1)	=(2)	▼	=	=	=
✓Yahoo!	A	20%	▲	▲	▲	▲	▲	▲	=	=(1)	=(2)	▲	▲	▲	=
AVERAGE			7.2	7.5	7.9	7.5	7.2	6.9	6.8	6.3	6.9	6.8	6.1	5.8	6.0	5.4

(1) Most important feature. (2) Second most important feature.

▲ Significantly better than average = Average ▼ Significantly worse than average ✓ denotes Readers' Choice

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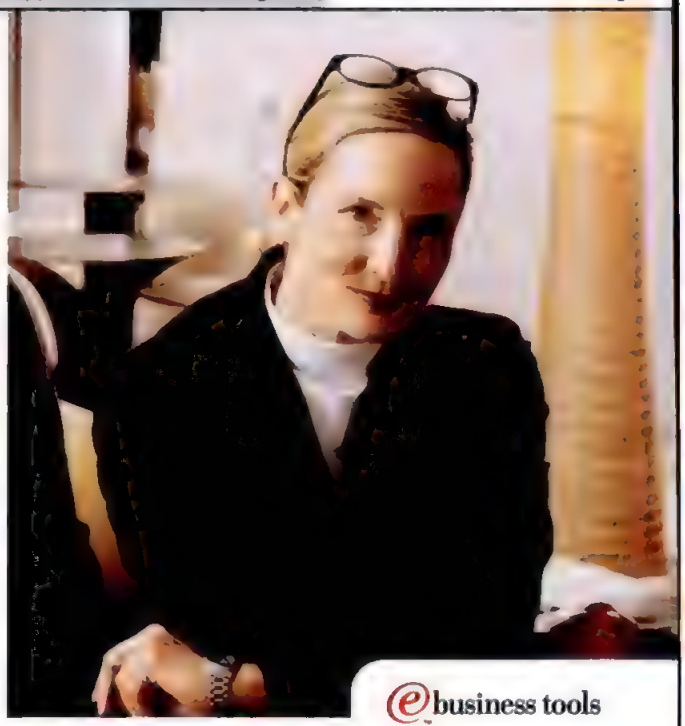

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Shopping

Two-thirds of respondents say they've purchased from at least one of the stores on

A SUCCESSFUL STORE WOULD HAVE great prices, selection, convenience, and service. For a brick-and-mortar store, it's hard to do more than two of these really well. But on the Web, where the whole world is just one click away, it often feels as if nothing is impossible.

So we asked how well 39 of the largest Web stores across five major categories could pull it off. Among them, 33 received sufficient responses for inclusion in our results. (For reviews of many of the same sites, see our story "eShopping Spree" in this issue.)

If you had to guess which companies did the best, you'd probably have no problem naming two of the top three: Amazon.com and Dell Computer Corp. But if you've never bought a video online, you might not have thought of Reel.com. Yet respondents regard this video superstore at least as highly as the other two: Each emerges as above average on our six key measures.

Books and computer-related merchandise turn out to be the most popular Web purchases. About half of our survey respondents have bought items in each category. And one-third say they've purchased music or videos online.

The sheer breadth of products to choose from appears to be the most important factor in buying online, though not surprisingly, price is also a motivating factor. But considering how many online stores claim to give away merchandise at or below cost, we were surprised that price satisfaction isn't a little higher. Perhaps shipping costs eat away at the price advantages; sometimes that's not disclosed until the screen that appears just before you click on the Buy button. Or it may be that the best brick-and-mortar stores already have good prices.

Considering that office-supply stores have only recently gotten their Web acts together, we are impressed that a quarter of our respondents say they've already visited these sites. Many have yet to make a purchase, but clearly the convenience of ordering your supplies from your PC is enticing: Just sit down at your desk with the catalog open and type in item numbers. And all three stores—Office Depot, OfficeMax, and Staples—offer free next-day shipping on Web orders over $50. Yet readers aren't going to these sites for the bargains, since this category has the lowest average score for satisfaction with overall prices.

It's difficult to tell whether the general-merchandise superstore concept is going to catch on. About 10 percent of respondents say they have visited Shopping.com, which provides a bundle of merchandise (books, music, movies, electronics, and computer equipment) similar to that offered at Buy.com (reviewed in the individual shopping sections below). Many fewer have visited the other four superstores we asked about: CyberShop (which did not receive sufficient responses for tabulation), iQVC, Netmarket, and Value America. These stores sell everything from garden hoses to the latest in Diamondique jewelry fashions.

BOOKS

Amazon.com (with a grade of A) remains the online bookstore of choice for our readers. About half have used the site, nearly three times as many as have visited the other three sites represented on our survey combined.

On the average, readers say they visit the bookstores a few times a month. Interestingly, 18 percent of those who say they've visited Borders.com and BuyBooks.com have never purchased from the sites, which (on a percentage basis) is twice as many window shoppers as there are at Amazon.

More than 70 percent of readers give Amazon.com, barnesandnoble.com, and Borders.com top ratings (from 8 to 10) for product selection. Typically, these stores can get you almost any book in print in a matter of days.

Prices, which are often discounted by 50 percent for best-sellers, rank just behind selection in customer satisfaction. To keep shipping costs from chipping away at the savings, most readers order several books at a time. The median purchase amount is in the range of $25 to $49, and a quarter of the respondents spend $50 or more at a time.

MUSIC AND VIDEO

Most of the stores in this category sell both music and videos in all the most popular formats. Reel.com (A in this category, along with Amazon.com) concentrates on videotape and DVD titles, although it does sell sound tracks. DVD Express sells anything on DVD, from movies to music and games. BMG and Columbia House are classic record and CD clubs gone virtual.

On the average, readers say they're visiting the music and video stores at most a few times a month, and nearly half say they only make online purchases a few times a year. Over 40 percent of those who patronize DVD Express, however, say they're visiting the site at least weekly, and 15 percent are purchasing once a week or more. The overall median purchase amount is in the $25 to $49 range.

SUPERSTORES

At this point, the Web superstores seem to be mostly a curiosity to our readers. Only about 20 percent of the respondents report going to these sites, but those who do visit fairly often. About a quarter of those who go to NetMarket and Shopping.com visit

Web Site Satisfaction Survey

SHOPPING SITES

READERS' CHOICE WEB SITES

	Grade	Percent of responses	Overall satisfaction	Likelihood to recommend	Product selection	Overall price	Ease of navigation	Customer support
BOOKS								
✓Amazon.com	A	73%	▲	▲	▲	▲	▲	▲
barnesandnoble.com	C	20%	▬	▬	▬	▬	▬	▬
Borders.com	C	4%	▬	▬	▬	▬	▬	▬
Buy.com	C	3%	▬	▬	▬	▬	▬	▬
AVERAGE			7.9	8.1	8.3	7.5	7.9	7.5
MUSIC AND VIDEO								
✓Amazon.com	A	33%	▲	▲	▲	▲	▲	▲
BMG Music Service	D	10%	▬	▼	▼	▬	▬	▬
Buy.com	C	8%	▬	▬	▬	▬	▬	▬
CDNow	B	23%	▬	▬	▲	▬	▬	▬
Columbia House	E	13%	▼	▼	▼	▼	▼	▼
DVD Express	C	4%	▬	▬	▬	▬	▬	▬
✓Reel.com	A	5%	▲	▲	▲	▲	▲	▲
Tower Records	C	3%	▬	▬	▬	▬	▬	▬
AVERAGE			7.6	7.9	8.0	7.3	7.6	7.3
SUPERSTORES								
✓iQVC	B	13%	▬	▲	▬	▬	▬	▲
Netmarket	C	13%	▬	▬	▬	▬	▬	▬
Shopping.com	C	44%	▬	▬	▬	▬	▬	▬
Value America	D	24%	▬	▬	▬	▼	▬	▼
AVERAGE			7.2	7.4	7.5	7.5	7.3	7.0

	Grade	Percent of responses	Overall satisfaction	Likelihood to recommend	Product selection	Overall price	Ease of navigation	Customer support
COMPUTER HARDWARE AND SOFTWARE								
Beyond.com	C	3%	▬	▬	▬	▬	▬	▬
Buy.com	C	18%	▬	▬	▬	▲	▬	▼
CDW.com	C	10%	▬	▬	▬	▬	▬	▬
CompUSA	E	9%	▼	▼	▼	▼	▼	▼
Compaq	C	2%	▬	▬	▬	▬	▬	▬
✓Dell	A	18%	▲	▲	▲	▲	▲	▲
Egghead.com	D	8%	▬	▬	▬	▬	▬	▼
Gateway	B	10%	▬	▬	▬	▬	▬	▲
IBM	B	2%	▬	▲	▬	▬	▲	▲
MicronPC	C	3%	▬	▲	▬	▬	▬	▬
✓NECX	A	3%	▲	▬	▲	▲	▬	▬
Onsale atCost	C	4%	▬	▬	▬	▬	▬	▬
PC Mall	D	4%	▼	▬	▬	▬	▬	▼
Warehouse.com	C	4%	▬	▬	▬	▬	▬	▬
AVERAGE			7.8	8.1	7.9	7.4	7.6	7.6
OFFICE SUPPLIES								
Office Depot	C	39%	▬	▬	▬	▬	▬	▬
OfficeMax	C	23%	▬	▬	▬	▬	▬	▬
Staples	C	36%	▬	▬	▬	▬	▬	▬
AVERAGE			7.1	7.2	7.5	7.0	7.2	6.8

▲ Significantly better than average ▬ Average ▼ Significantly worse than average
✓denotes Readers' Choice.

on at least a weekly basis, but at least 42 percent have never actually purchased from these sites.

The few survey respondents who have shopped iQVC seem to feel the company has successfully translated the strengths of its television shopping network to the Web, offering good prices and good support. On the other hand, readers aren't at all impressed with Value America's prices or its customer support.

COMPUTER HARDWARE AND SOFTWARE

Our surveyed computer stores fall into two categories: *retailers* such as Buy.com, Computer Discount Warehouse, and NECX, which sell a wide variety of computers, peripherals, and software, and *direct PC vendors* such as Dell and Gateway, which sell their own brands of computers.

Readers tend to visit the retailers more frequently than the PC vendor sites, and they make more frequent but smaller purchases on the retail sites. The direct system vendors receive very high scores for selection and ease of navigation, especially Dell (A), probably because these sites let you easily view the companies' entire selection and choose the right PC. NECX (also A) has the highest scores for both price and product selection in the retail category.

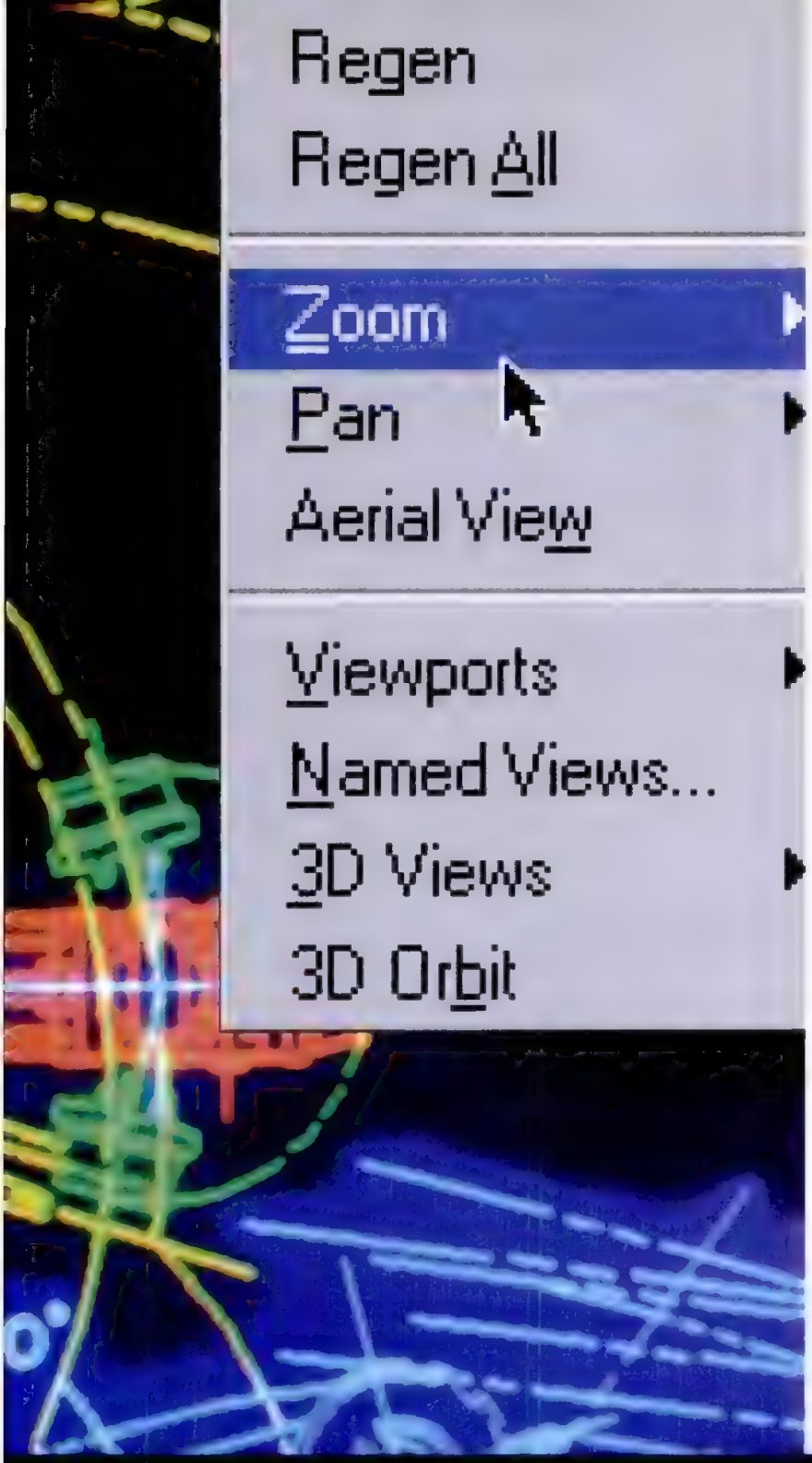
Readers are very disappointed with CompUSA's online efforts. The brick-and-mortar PC superstore's site has extremely low scores in every category we measured.

OFFICE SUPPLIES

Generally, we don't see major differences among the scores for Office Depot, OfficeMax, and Staples (each with a grade of C). Nearly half of the respondents who say they've visited these sites have never purchased from them.

The three stores don't offer any price advantages for buying online, just the convenience of being able to place an order right from your PC. The office-supply category's overall customer-support scores are also the lowest among all the groups of stores we surveyed.

Our Contributors: MICHAEL J. MILLER is editor-in-chief of *PC Magazine*. Executive editor BEN Z. GOTTESMAN was in charge of this story.



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Auctions

Not everyone has caught the auction bug yet, but those who have are [illegible] these sites more often than buyers in any other category.

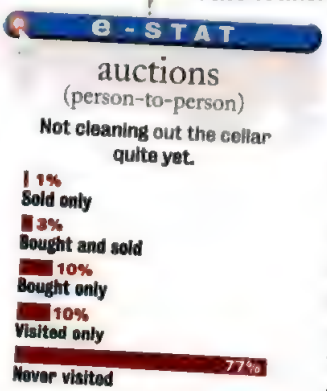
IF 1998 WAS THE YEAR ONLINE shopping took hold, then 1999 has been the year of the auction. Everything you can imagine was on the trading block, from Beanie Babies to computer systems to entire companies. And every major Web site seems to think it can be the next Christie's, or at least the next eBay (which, it should be noted, has a market capitalization many times greater than that of any traditional auction house).

Two types of auction sites have emerged:

- Person-to-person sites, such as eBay, let anyone place items up for bid. The site manages the bidding process and takes a small percentage of the purchase price but typically does not get involved in the actual transaction.
- Merchant sites, such as Onsale atAuction, tend to act more as liquidators, putting other companies' overstock on the trading block.

When many people think of auction sites, they envision bargains—but if that's your frame of mind, you may end up very disappointed. Respondents are less satisfied with the purchase prices at auction sites than with those offered at most types of Web stores. This doesn't necessarily mean that the auction prices are higher than the store prices, only that they're not meeting expectations.

The real value in auction sites is not in bargains but in finding items that you wouldn't be able to find anywhere else. Discontinued china patterns, old camera lenses, and a previous-generation scanner are all perfect fodder for auction sites.



PERSON-TO-PERSON AUCTIONS

More than almost any other service on the Web, person-to-person auction sites require community. You're most likely to shop where the most products are offered, and you're most likely to sell where the most shoppers are. This has been the core of success for the Readers' Choice, eBay (with a grade of A). Amazon.com Auctions (C), Excite Auctions (C), and Yahoo!Auctions (D) all hope they can take advantage of the huge audiences frequenting their other businesses, but it's going to be a tough road. eBay had more than four times as many respondents as runners-up Amazon.com and Yahoo!, and more than ten times as many as Excite.

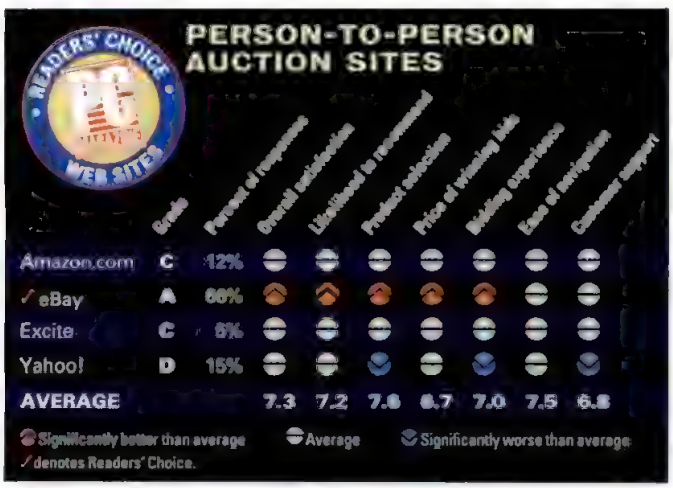
Despite highly publicized service outages, readers are still as satisfied with eBay's support as with that of any other auction site. Readers do say they access Amazon.com more quickly and reliably than eBay. Overall, satisfaction with customer support in this category is significantly lower than in most of the shopping categories.

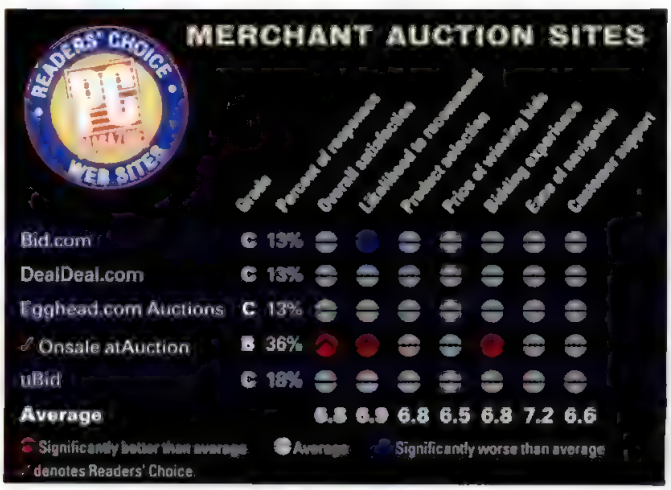
Also of interest: Respondents who use these sites visit an average of ten times a month (12 percent visit daily!), and the median price of purchases is $50 to $99. Fewer than 1 in 20 respondents have actually auctioned off their own merchandise online; again, this group overwhelmingly selects eBay, citing its good customer base.

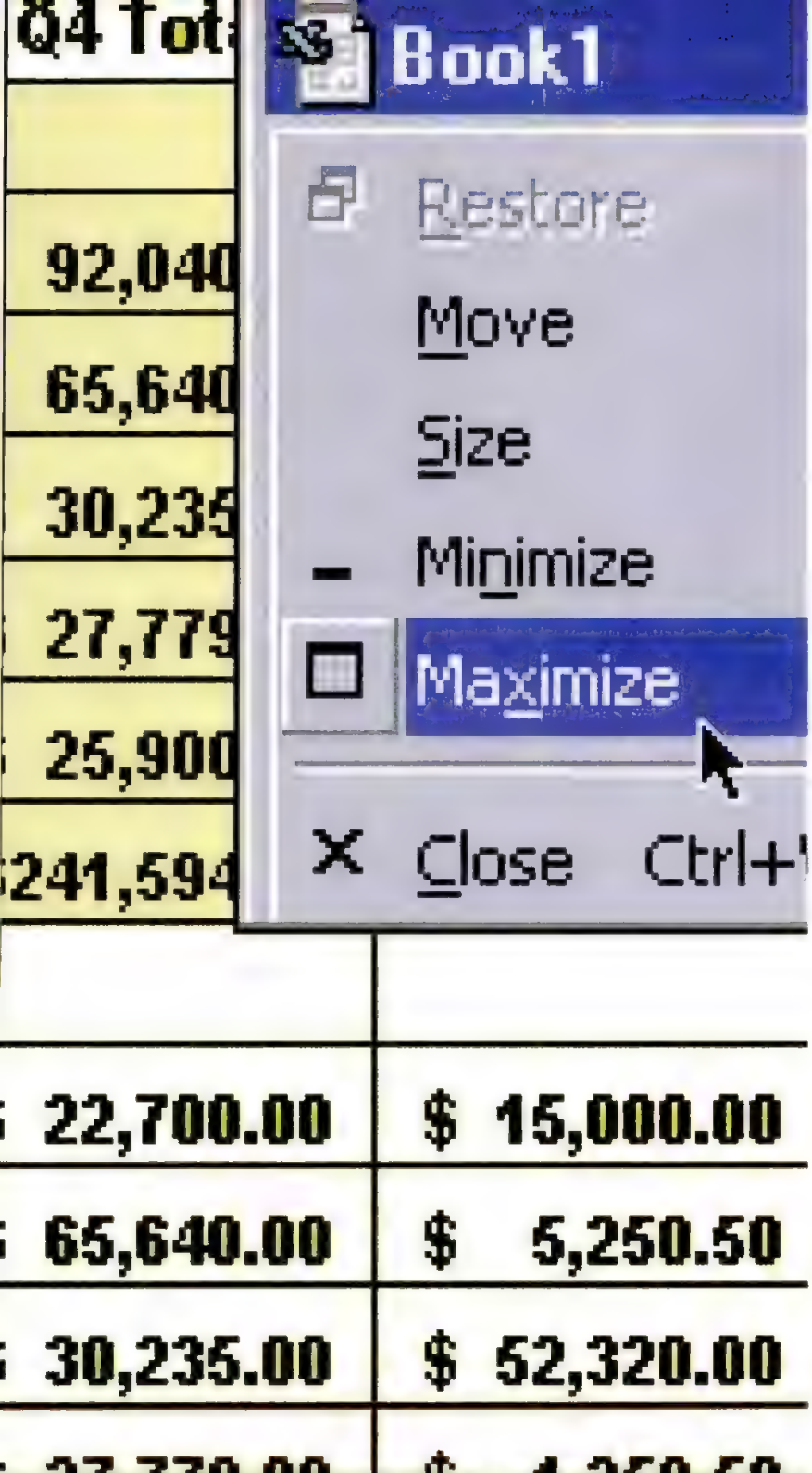
MERCHANT AUCTIONS

Buying through merchant auctions is the least popular of the seven forms of online shopping in our survey. There are no stellar performers in the group. Merchant auctions pique curiosity, and over a quarter of those who use these sites say they visit at least once a week. But 35 percent say they have never actually made a purchase.

Respondents say they are very dissatisfied with Bid.com. In fact, the site receives disturbingly low scores for satisfaction with security and privacy, both of which aren't much of an issue with any of the other sites. And half of those who say they've visited Bid.com have never actually made a purchase, a much larger percentage than for the other sites, especially compared with our Readers' Choice Onsale atAuction (B), where only 25 percent have never made a purchase, and Egghead.com (C), where the figure is 27 percent.







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Investing

When your money is at stake, you're not going to linger long if you're [illegible] the service you feel you deserve.

THE ONLINE INVESTING PHENOMenon certainly hasn't escaped *PC Magazine*'s readers. About 20 percent of our survey respondents report already having online brokerage accounts. And while very few would fall into the day trader category, they are taking advantage of the quick and easy access the Web affords to keep tabs on their money and plan their next moves.

e-STAT

investing

Who's investing online?

Income less than $75,000	12%
$75,000–$149,999	26%
$150,000 and over	39%

The top 3 online brokerage firms, E*Trade, Charles Schwab, and Fidelity, account for 65 percent of the survey responses, but the remaining 35 percent is spread across 14 different companies. If you don't see a company listed in the scorecard, it did not receive enough responses to be included.

We asked survey respondents whether they already had accounts with their brokerages before going online. Nearly 80 percent of the DLJ*direct* customers are new customers as well. On the other hand, Fidelity and Schwab seem to be mainly taking their existing customers online; less than 20 percent of the respondents who use these brokerages started with them on the Web. TD Waterhouse Securities has an almost even split. Obviously, E*Trade customers are converts and first-time investors; E*Trade is an online-only company. 15 percent of E*Trade customers categorize themselves as inexperienced, nearly four times the figure at Schwab.

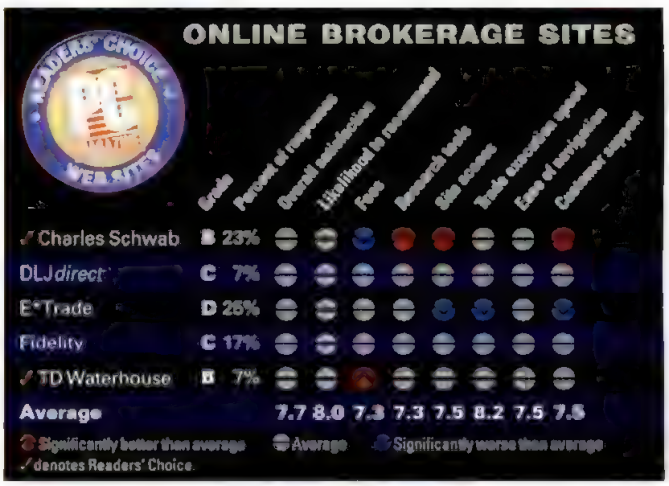
More than a quarter of our respondents are checking their accounts at least once a day, and more than half check at least a few times a week. Actual day trading is much less common: Only 1 percent trade daily. The median is a few trades per month. E*Trade and Waterhouse customers trade most frequently; these two companies have the lowest transaction fees.

Interestingly, the highest grades go to the brokerages at opposite ends of the fee spectrum, Schwab and Waterhouse (both with B's). Waterhouse charges just $12 for most trades—the lowest among the group—whereas Schwab's fees are the highest: $30 for the first 1,000 shares, plus 3 cents per share thereafter. But respondents seem to realize that you get what you pay for: They praise Waterhouse's fees but appreciate the tools and hand-holding that Schwab provides.

When you make a trade over the Web, you're giving up the ability to talk directly to a broker. This doesn't seem to be a concern, though. Respondents feel that Web-based trades have been executed according to instructions and, in general, executed in a timely fashion. E*Trade customers take some exception on the timeliness issue. Only about half rate timeliness very highly (8 or above), whereas more than 70 percent of the other brokerages' customers give high ratings for timeliness.

In addition, E*Trade scores significantly lower than Fidelity and Schwab for ease of accessing accounts by phone, a very important service when you're not near your computer and you need to make a move. This is probably especially frustrating because the ability to get to the site quickly and reliably scores lowest as well. But despite these issues, E*Trade users are generally happy with their choice of broker.

Although DLJ*direct* is nearly as pricey as Schwab and Fidelity (Fidelity charges $25 for the first 1,000 shares and 2 cents for each additional share, DLJ*direct* $20 for the first 1,000 shares traded and 2 cents for each additional share), DLJ*direct* customers do not necessarily feel they are getting their money's worth. Fidelity and Schwab score higher for overall satisfaction and likelihood of being recommended, as well as satisfaction with research tools and customer support. PC



How We Surveyed

In July, together with Audits & Surveys Worldwide (*www.surveys.com*), we mailed over 4,000 questionnaires to a randomly selected sample of PC Magazine subscribers. We closed the survey in early September, when we had achieved a 50 percent response rate.

We asked the subscribers to rate their satisfaction with their most frequently used sites, using a scale from 1 ("extremely dissatisfied") to 10 ("extremely satisfied"). Sites for which we received 30 or more responses—the minimum necessary to produce statistically reliable results—are included in the final tabulations.

On each survey question, the individual readers' *ratings* for a given site are averaged to produce a numerical *score*. A statistical *t-test* is used to compare each site's score against the a[illegible] for all sites in the category to determine, at a [illegible] percent confidence level, whether the score is *significantly different* from the [illegible]. Then each site gets a letter grade, based on its number of scores that are above or below average.

For a more detailed breakdown of the results, visit our Web site at *www.pcmag.com*.

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WINNER BEST OF SHOW 99

*Figures assume 2.1 ALDC hardware compression $1,295 MSRP for internal kit

Our brick-and-mortar store nestled away on an urban side street.

setting up shop online

BY NEIL RANDALL

It's never been easier—or cheaper—to turn your store into an e-store.

With online sales hitting $20 billion in 1999 and predicted to reach $184 billion by 2004 (according to Forrester Research), the question is no longer *whether* you should put up a Web storefront but *when*. What you'll find out is that "right now" is probably both the desired and the realistic answer. Not only are more storefront solutions available now than there were for last year's roundup, but the most recent of these

PHOTOGRAPHS BY THOMAS O'CONNOR

Editors' Choice

- Bigstep.com
- freemerchant.com 2.0

What a difference a year makes, at least in Internet time. Consider that our Editors' Choice in this category last year charged $79.95 a month for its services, and that our Editors' Choices in this roundup go to two sites that don't charge anything. Both Bigstep.com and freemerchant.com 2.0 offer feature sets on a par with, or even better than, the for-fee sites in this roundup. (Eventually both of these sites will offer additional for-fee services, but they claim these will always be optional.)

Bigstep.com's excellent setup features (including a convenient to-do list) and its design flexibility more than make up for its biggest shortcoming: forcing users to sign up for a merchant account through the site. The terms of service for the merchant account are extremely competitive, however, and the implementation is trouble free; it's only the lack of choice that we begrudge. Bigstep.com covers more than the e-commerce basics, providing support for unlimited products plus reports to track site use and customer activity.

If you want to make a little extra money—and we do mean little—by displaying ads on your site, freemerchant.com will be happy to oblige. freemerchant.com will also let you choose the advertisers to suit your site. But even if you don't want ads, freemerchant.com will still let you put up a great, full-featured site without charge. You also get top-notch importing features and exporting to Intuit's QuickBooks as well as an inventory checker, which alerts you when you're low on inventory and lets your customers place back orders.

solutions are free. Services such as Bigstep.com, eCongo.com, and freemerchant.com 2.0 offer free hosting for your store. But the word *free* is open to interpretation. Sure, you can create a site and sell as many things as your heart desires, but how much will it cost to accept credit cards or set up a merchant account? To be fair, these costs popped up with the for-fee sites as well.

When you're looking for the right storefront solution, the question isn't just one of features, of course, but really one of which features you actually need. Each of the sites covered here offers a Web site building tool and shopping cart feature. If you want a storefront but you know little or nothing about HTML or Web editing software, you won't care whether there are HTML options. For many merchants, a storefront that is easy to set up and works as advertised is probably the order of the day. And several sites offer reasonably fast start-ups (though they'll rarely be as fast as advertised if you have anything more than a bare-bones store).

Store building aside, to make money you need an ordering system that customers can use easily and that you can use to view those orders and act on them quickly. All the services covered here offer the former (with some variation in quality), but the latter is less consistent across the board. All these services let you get your orders, but not necessarily by e-mail or fax; some are just online. You can process the orders at any of the sites, but not necessarily according to your existing record-keeping needs. The issues of credit card processing, shipping options, tax calculation, and order tracking also come into play here, and before you commit to your store, you need to find out precisely how the software handles these details.

If you have more than a few items to sell, you must also consider the software's catalog features. You can build catalogs item by item, but the methods differ quite a bit from service to service. Some let you import product information, but you need to make sure that the fields and other areas match up. Not all services let you export your data to a spreadsheet or database, another consideration. And though some have inventory management systems, you'll want check that the service matches or improves on your current inventory tracking. And, of course, you may need reports on products, customers, sales taxes, and shipping costs, so check for these as well.

For this roundup we targeted merchants running relatively small businesses who wanted to add online sales to an existing brick-and-mortar store. We also assumed a modest need for site and sales reporting and inventory control. If that's you, take a look and see what we discovered, then head for the sites and give them a try.

in this review

Bigstep.com 138
eCongo.com 139
freemerchant.com 2.0 140
IBM HomePage Creator 142
iCat Commerce Online 144
MindSpring Estore Deluxe 148
Sitematic Catalog 152
Yahoo! Store 154
Your Virtual Virtual Store 142
Other Storefront Solutions 150

Bigstep.com

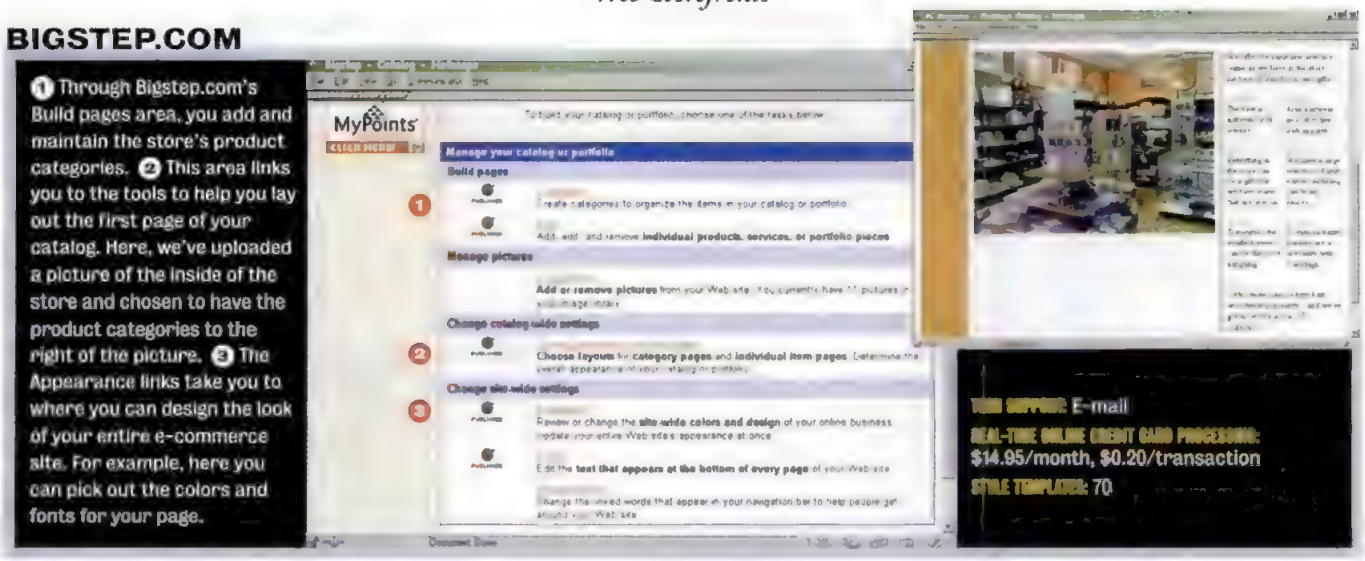
Free. Bigstep.com Inc., San Francisco; 415-229-8500; www.bigstep.com.

Our Editors' Choice Bigstep.com has gone the extra mile to provide a well-rounded Web site and storefront package that has no hosting fees. But you must arrange a merchant account through Bigstep.com—even if your business already has one. Aimed at small and medium-size businesses, Bigstep.com simplifies the work of developing a Web site and storefront with its step-by-step process.

Bigstep.com requires you to establish an account with Cardservice International, which includes, among other things, a merchant account, real-time credit card–transaction processing, and calculation of the shipping and taxes. The service costs $14.95 a month plus 20 cents per transaction; since Bigstep.com's com-

Our Contributors: NEIL RANDALL is a contributing editor and NELSON KING and SARAH L. ROBERTS-WITT are frequent contributors to *PC Magazine*. Associate editor NANCY E. HIRSCH and PC Magazine Labs project leader DIANE JECKER were in charge of this story.

BIGSTEP.COM



❶ Through Bigstep.com's Build pages area, you add and maintain the store's product categories. ❷ This area links you to the tools to help you lay out the first page of your catalog. Here, we've uploaded a picture of the inside of the store and chosen to have the product categories to the right of the picture. ❸ The Appearance links take you to where you can design the look of your entire e-commerce site. For example, here you can pick out the colors and fonts for your page.

plete storefront puts no limits on the allowable number of items or transactions, this is a minimal cost. The only limit Bigstep.com imposes is on the site's graphics: 12MB.

During setup and catalog building, Bigstep.com maintains a convenient to-do list of tasks and their current status. Bigstep.com will guide you through building up to 12 Web pages for your site (but an unlimited number of pages in the catalog section), including a customer survey and a map locator. Bigstep.com does most of the work by providing templates, which you can customize by choosing colors and fonts. Entering items into the catalog is a well-organized process, but it must be done manually (there's no database upload).

The storefront produced by Bigstep.com isn't fancy, and the service provides only a few promotional tools. Bigstep.com will register your site with some of the major search engines and send out a newsletter (you create the newsletter and Bigstep.com will e-mail it to your customers).

Unlike iCat Commerce Online, Bigstep.com does not have such back-office capabilities as inventory management or compatibility with accounting software. It does, however, provide a more-than-adequate set of reports to track site use and customer activity, and its catalog and shopping cart do the job adequately.

Much thought and effort went into Bigstep.com's interface. The service stands out for its ease of use and low cost. With a few more features for store operation, it would be unbeatable.—*Nelson King*

eCongo.com

Free. eCongo.com Inc., Los Gatos, CA; 877-871-7980; www.econgo.com.

●eCongo.com, another free Web commerce service, was still in public beta when we concluded our review, but it has some useful qualities, such as the ability to create promotions for your store rapidly and to place ads on other stores within the eCongo mall (similar to Yahoo! Store in both of these features). eCongo offers limited software capabilities and hasn't yet implement automated taxation and shipping calculation. But eCongo plans to make money from an ad scroll bar (text-based, fast loading, and unobtrusive) that will run on each site, and through OEM and cobranding deals with ISPs. Also, eCongo will offer optional as-yet unannounced for-fee premium services.

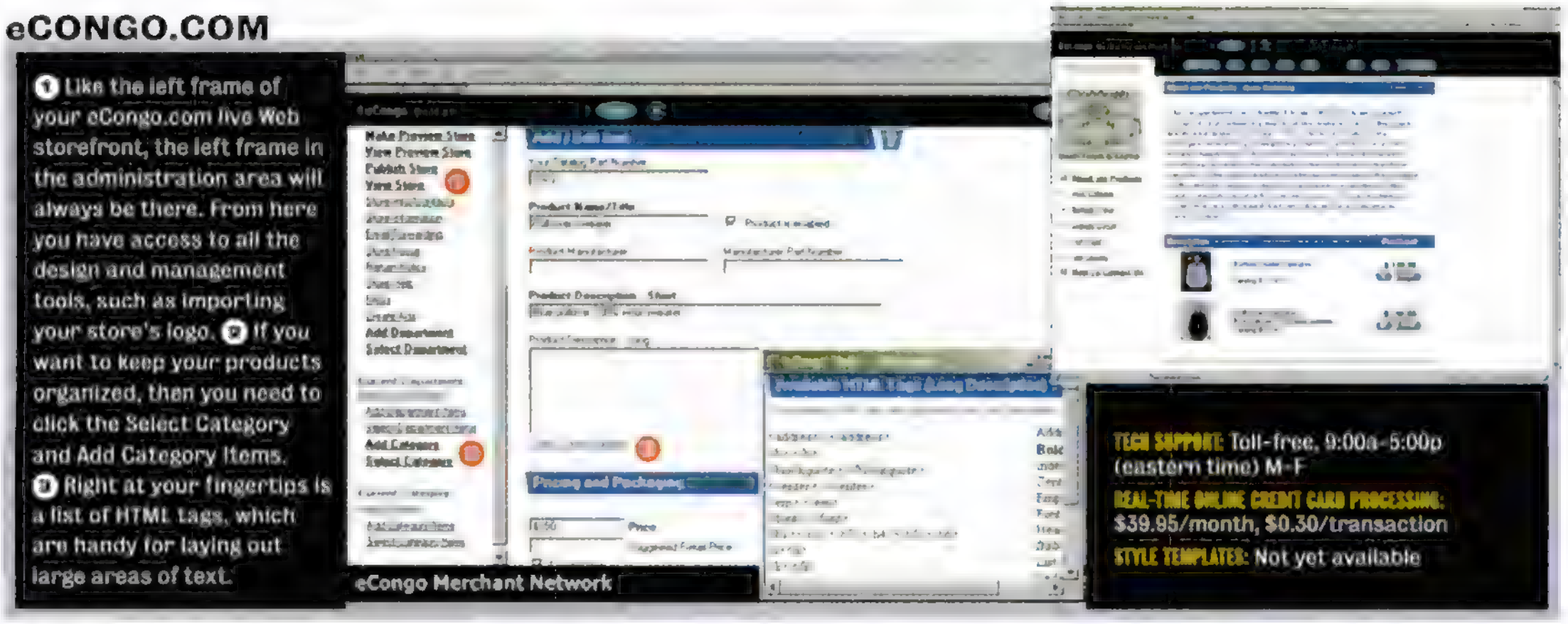
To build your site, you can use either the Basic Builder or Advanced Builder. The biggest drawbacks to the setup are that you have to do lots of clicking back and forth, and that you can't preview pages as you build them. Officials at eCongo say this and other kinks should be smoothed out by the time you read this. eCongo can easily upload graphics and create catalog items. But for now you must add each item to your catalog manually. By the end of the year, according to the company, eCongo will support some

For setup, we look at how fast and easy it is to register and create a catalog, the variety of templates, and the use of design wizards. Rating **storefront design** includes whether the product uses an authoring tool or requires HTML. We evaluate the ease of inputting text and graphics. The **order processing** system includes tax and shipping calculation, credit card integration, and order confirmation. For **hosting,** we check whether the product can register the domain name and merchant account, if the site is registered with search engines, and if the store is part of a mall. For **administration and reporting,** we judge the product's ability to integrate with inventory, accounting systems, and customer databases; and to report site analysis, order status, and statistics.

	Setup	Storefront design	Order processing	Hosting	Administration and reporting
EDITORS' CHOICE Bigstep.com	Excellent	Good	Good	Good	Good
eCongo.com	Good	Good	Poor	Good	N/A
EDITORS' CHOICE freemerchant.com 2.0	Fair	Good	Excellent	Excellent	Good
IBM HomePage Creator	Good	Good	Good	Good	Fair
iCat Commerce Online	Good	Fair	Excellent	Good	Good
MindSpring Estore Deluxe	Fair	Fair	Good	Good	Good
Sitematic Catalog	Good	Good	Good	Good	Poor
Yahoo! Store	Good	Good	Good	Excellent	Good

N/A—Not applicable: The product does not have this feature.

eCONGO.COM



import capabilities. Like the other free sites, eCongo doesn't limit the number of items you can have in your Web store.

Full-featured reporting, automated payment, and order processing were not available in the public beta we reviewed, but they will be by year end. Currently you can search across your orders and create a filtered list based on such criteria as new, shipped, and back-ordered items.

The in-store promotion feature gives eCongo its strength. By clicking a couple of boxes and entering some information for specific catalog items, you can quickly build a section of text that will appear on the home page of your store to point customers towards the featured merchandise. Yahoo! Store was the only other product that could come close to eCongo's promotion features.

Though still rough, eCongo clearly has potential. The price is right, and the service's goal of building a rich merchant community with mutual back-scratching can be nothing but good. Like all the free services examined here, eCongo still has to prove itself, but it offers adequate ease of use and small-business oriented features.—*Sarah L. Roberts-Witt*

freemerchant.com 2.0

Free, freemerchant.com, Emeryville, CA; 510-595-2500; www.freemerchant.com.

Our other Editors' Choice in this roundup, freemerchant.com 2.0, is also a free site that provides all the basic site-building features, excelling in such areas as importing and exporting and promotions. One big point of departure is that freemerchant.com lets you earn money by displaying ads on your site. Each month freemerchant.com calculates the revenue it receives from these ad banners and keeps 50 percent. Then, by analyzing click streams, freemerchant.com determines which of its users' sites contributed to the traffic through the ad banners and electronically sends you your share. (Store owners can also dispense with the ad banners and still not be charged for their site.)

freemerchant.com's store-building system is basic and a bit confusing. At review time, the online tutorial was not available, and having it certainly would help. Laying out the page precisely as you want requires considerable tinkering, but there are about 50 different templates to choose from. Similar to Bigstep.com, freemerchant.com can import a street map to show your physical store's location. The builder's tools are especially helpful for setting categories, subcategories, and items for sale.

The Payment Gateway lets you establish precisely how you want shipping, taxation, and transactions to work. Catalog maintenance includes an automatic inventory checker that alerts you when you're low on a product and will either let customers place their orders (which will be labeled "on back order") or will stop taking orders for that item. You can also import catalog data from Microsoft Excel and Lotus 1-2-3 spreadsheets or dBase, FoxPro, and Paradox databases. To keep track of invoices, freemerchant.com can export invoice data to Intuit's QuickBooks. freemerchant.com does have a site-traffic logging system, but it can report only the numbers of hits per specific period.

When you fill out a form with your site's title, description, and keywords, the Site Promotion system will list your site with AltaVista, Excite, HotBot, and others. freemerchant.com's eBay pro-

PC EDITORS' HOT LINKS

www.pcmag.com/hotlinks
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➤ **E-Commerce Times**
www.ecommercetimes.com
A comprehensive resource for those who want to sell products online. E-Commerce Times has everything from general technology news and advice for the small business to message boards and upcoming e-commerce conferences.

➤ **Sell It On The Web**
www.sellitontheweb.com
This site is good for those just getting started with a Web storefront. It has all sorts of e-commerce guides, reports, and newsletters. The e-commerce 101 area lists useful tips on everything from how to pick an ISP to how to accept credit cards as payment.

➤ **Web Site Garage**
websitegarage.netscape.com
Sponsored by Netscape, this site helps you promote and improve your existing Web site. Here you can register your site with major search engines, and also analyze your site's performance (checking for load time, spelling, dead links, and more). You can sign up for Hitometer, which will keep track of your site's daily, weekly, and monthly hits.

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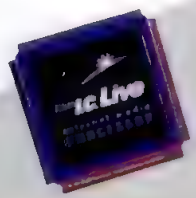

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max internet COMMUNICATIONS

Your Virtual Virtual Store

Already have a Web site? You, too, can jump on the e-commerce bandwagon, and you won't even need to worry about buying and stocking products to sell. Instead of dealing with manufacturers and the myriad details of operating an online store, you can go to a storefront broker like Affinia (*www.affinia.com*), eSaler.com (*www.esaler.com*), or Vstore (*www.vstore.com*), and they'll do it all for you.

These companies act as middlemen between your site and online merchants that have the products and the retail expertise. You pick and choose what to sell to match the themes of your site and the products you think might interest your visitors. The products are displayed on your own Web pages, creating, in effect, a virtual storefront stocked with merchandise that is actually handled by another online merchant.

Starting an affinity storefront couldn't be much easier. You go to the Web site of a storefront broker and sign up, then build your storefront using your browser to run setup software provided by the broker. When completed, the products displayed at your site are hyperlinked to the site of the retail merchant (usually the broker, too), and you're in business. If you don't display many products, the whole procedure can take only minutes.

In the case of Affinia, the products usually indicate which online store they come from, and when customers decide to buy something, they are linked to the merchant's site for ordering. Vstore takes a different tack and presents the same shopping cart and ordering process no matter which merchant is involved, because everything is done through the Vstore site except for order fulfillment. eSaler takes an even more covert approach by embedding storefronts, called *Shoplets*, into your site. The online customer may never notice that your storefront is a brokered e-commerce site.

Storefront brokers deal with the complexity of the transactions, including who gets paid for what, and are responsible for bringing together merchants and reseller sites. The brokers are similar to the distributor in standard retail, but in this case no product moves—only electronic data flows back and forth. Products are ordered by a customer at your site, transacted through a user interface provided by the storefront broker, and shipped by the merchant.

Storefront brokers don't charge you for their services. They make their money in other ways, such as taking a commission from the merchant out of the product price—typically 5 percent to 25 percent—or by collecting from the merchant a finder's fee per customer. Likewise, your storefront usually takes a cut on a per-product basis, again in the range of 5 to 25 percent. (New schemes for paying the broker and storefront site appear regularly.) While these brokered sales represent a loss of margin for the original merchant, this is a volume game. By multiplying the number of outlets for the products—sometimes by the thousands—merchants stand to make more money.—*NK*

Affinia (top) and eSaler are two examples of new services that can add e-commerce to your Web site.

motion feature works roughly the way Sitematic's does in that you must first establish an account with eBay and then fill out a form within freemerchant.com so that eBay can point to the product you intend to auction.

freemerchant.com's unique business model and advanced feature set make this free site an excellent choice.—*Neil Randall*

IBM HomePage Creator

$69.95/month plus $50 setup fee for Silver Plan. IBM Corp., Armonk, NY; 888-426-5800; www.ibm.com/hpc.

● Recognizing that small and medium-size businesses need a simple and affordable solution to test the waters of e-commerce, IBM Corp. designed IBM HomePage Creator as a tool to make the storefront creation process easy. IBM has largely accomplished that goal, but HomePage Creator lacks the sales analysis tools you might need to understand your business better.

In typical IBM cover-all-the-bases fashion, you can start by choosing among five plans ranging in monthly fees from $24.95 to $200, plus a setup fee that is different for each plan. The plan we tested, Silver, covers 50 catalog items and is limited to 15 Web pages with a total of 50MB of content. If you go over the 50MB limit, IBM automatically bills you for the extra storage space. To handle online transactions, you need to sign up for a merchant account and real-time credit card processing. The cost of this account depends on which service you decide to use.

Included with all the pricing plans is IBM's HomePage Creator software, a Java applet that you download to your system the first time you sign on. IBM provides an excellent tutorial and step-by-step guide to creating the Web site and storefront (you can even get a printed manual). IBM also includes Drawing Board, a fairly comprehensive WYSIWYG authoring tool that provides fea-

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Rachel replaced her faulty notebook adapter, ordered a new battery and found the wireless modem she was forever hunting for, prompting one more happy igo.com customer to proclaim...

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FREEMERCHANT.COM 2.0

tures such as fonts and colors to customize Web pages. IBM's free-form, do-it-yourself approach to building the Web site and catalog may take more time to learn but gives you greater flexibility.

By contrast to Drawing Board's versatility, HomePage Creator's reporting, site analysis, and sales promotion tools are quite limited. The reporting tool, for example, posts only a list of outstanding orders, where a product like iCat compiles logs of the number of hits on a certain product, among other statistics. In general, HomePage Creator has scant tools for merchants to analyze and promote product sales, especially compared with iCat, Sitematic, or Yahoo! Store.

IBM HomePage Creator starts out strong in the development of your Web site and the appearance of the storefront but has weak reporting and site analysis. Considering IBM's attention to support, though, we think HomePage Creator is a decent value.—*NK*

iCat Commerce Online

$49.95/month for 50 items. iCat, a division of Intel Corp., Seattle; 206.505.8815; www.icat.com.

● One of the founding members of the small-business Web-hosting market, iCat Commerce Online hasn't changed much since we looked at it a year ago. The store-building software, though easy enough for novices, is still constraining. But iCat does help users set up online transaction processing, and its reporting features are outstanding.

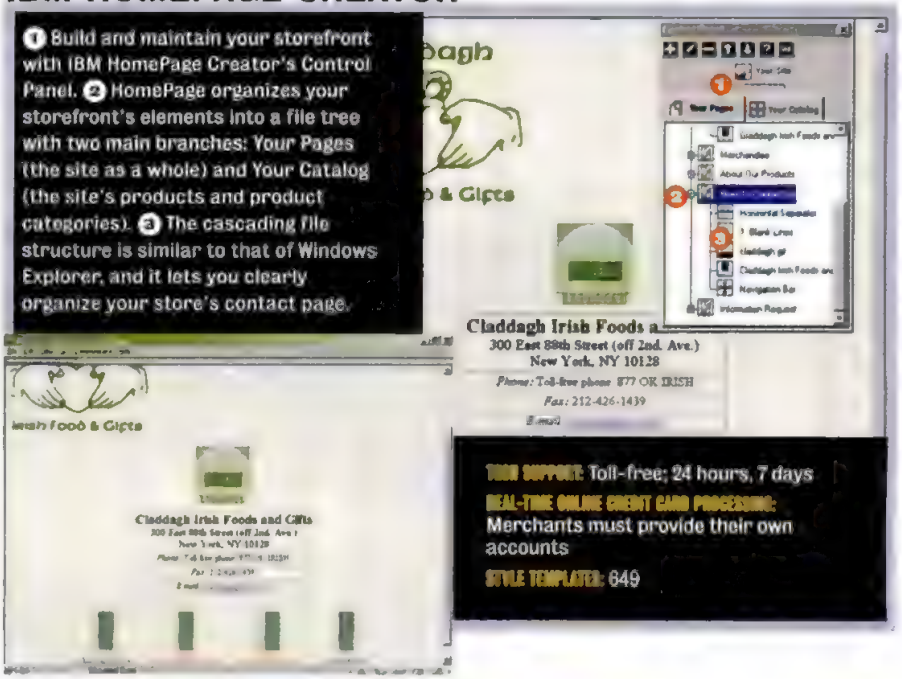
Getting started with iCat's service is straightforward. The Store Design section walks you through choosing a preconfigured store layout (some of which included search features) and one of five design templates. You can quickly upload images into your Web storefront and can choose among a few fonts and colors. The resulting Web site is adequate but not exactly stylish. As for building your Web storefront's catalog, unlike with eCongo.com, MindSpring Estore Deluxe, or Sitematic, you can import a Microsoft Excel or tab-delimited file with your store's product information.

When you design the catalog, you can easily build different sections and assign products to them. Whether or not you import your product data, you still have to manually assign items to each section. Also, you can create promotions and sales for your store's merchandise.

iCat has a well-designed Checkout options section, in which you enable the shipping tables and taxation methods that iCat uses to calculate costs for a customer. The Checkout Options section includes direct links to forms through which merchants can request information about Internet merchant accounts and iCat's Commerce Online payment service. Through this payment service, iCat helps merchants set up an Internet merchant account and real-time credit card authorization for a setup fee of $300 and a $45 monthly charge (plus 35 cents per transaction).

iCat's reporting features are top-notch. For example, you can create best-

IBM HOMEPAGE CREATOR



Here's
something
interesting.
Something
that may
throw a
curve
into your
network
plans. The
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switches with
the highest value
and lowest
price per port
aren't from
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or Cisco.

They're from
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same with Gigabit. To ready
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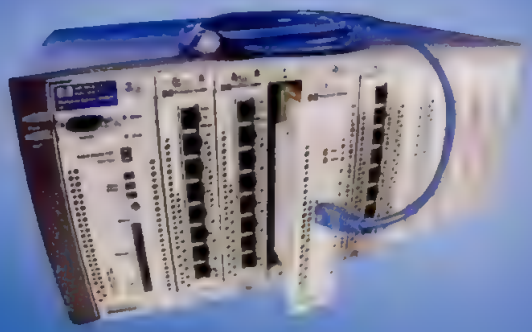

Switch 4000M
10/100/Gigabit

HP ProCurve 4000M $89 per port
3Com SuperStack II 3300 $156 per port
Bay Networks 450T $173 per port
Cisco 3524XL $156 per port
72-port configuration list prices

Switch 2424M
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Which is why you
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call and show you how
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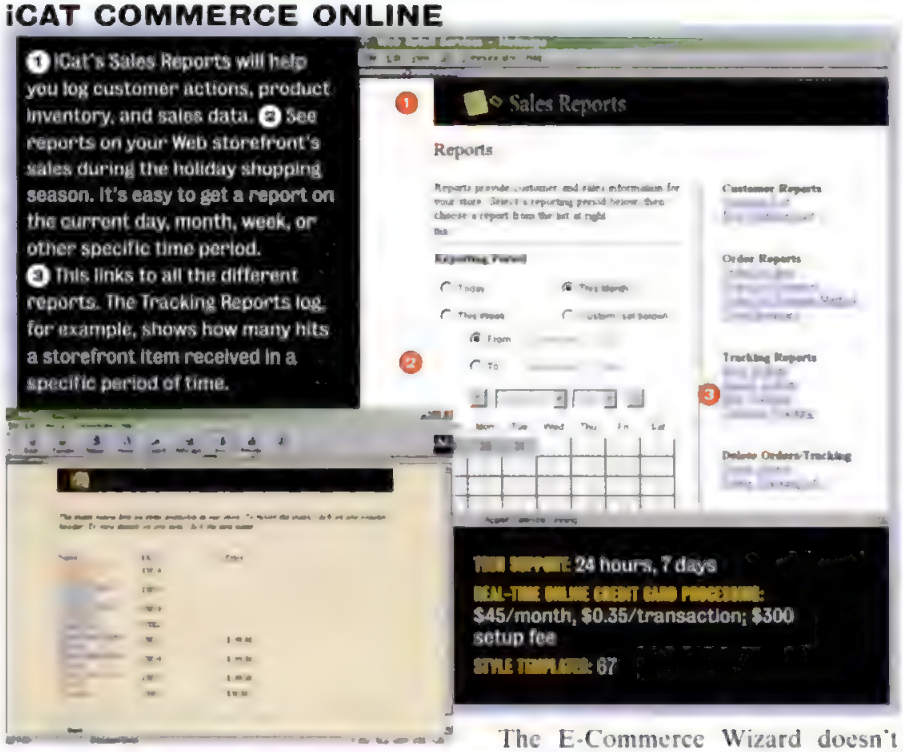
customer lists and generate reports on the click-through activity of individual customers to determine which parts of the stores are effective and which aren't. You can also build reports for the day, the week, the month, or another time period and export it to a text file.

iCat's storefront creation is easy if inflexible, and the reporting and transaction processing portions of the service are first-rate. Although it's not free like some of the products in this review, the little extras make it worth investigating. —*SLRW*

iCAT COMMERCE ONLINE



MindSpring Estore Deluxe

Hosting fee: $109.90/month for 100 items. Secure server fee: $125/year. MindSpring Enterprises Inc.; Atlanta; 888-677-7464; www.mindspring.net.

● Perhaps because MindSpring Enterprises (now EarthLink) is primarily an ISP and Web host, the company's Estore Deluxe is more like an add-on than an integral part of the service. Estore is the only service in our roundup that assumes its users have HTML or other Web-authoring knowledge and that doesn't include the cost of a secure server in its hosting fee. Additionally MindSpring charges to host real-time credit card processing ($35 per month for 100 transactions and 50 cents for each additional transaction), on top of the fees you pay for your merchant account and card-processing service. Estore is an expensive choice.

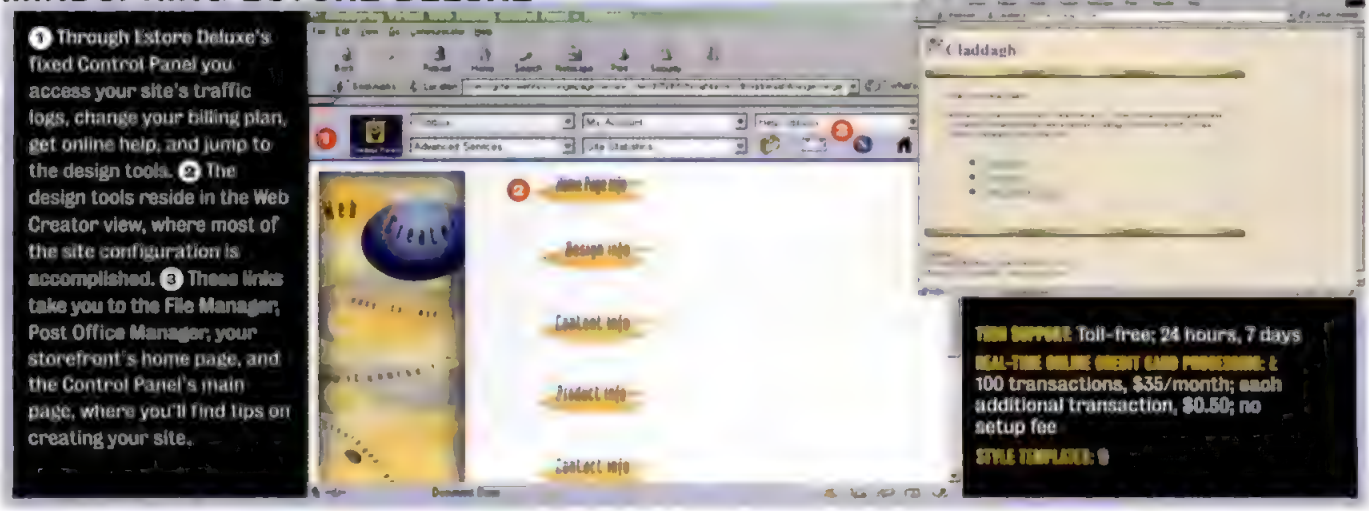
The Estore package gives you both a Web site and a storefront. After you receive confirmation, user ID, and password via e-mail, you can start building your site. MindSpring doesn't properly integrate the site and the storefront, and nowhere does the company inform you that you must use HTML to link the two. You start with the Site Creator, a rudimentary tool of templates and wizards, to create a basic Web site, and then go to E-Commerce wizard to build the catalog at a different URL.

Like most of the products in this roundup, Estore's Site Creator offers various style templates; you can't modify the colors and layout of these templates, however. Given the crude tools it's very difficult to create a professional-looking storefront.

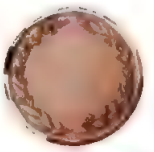
The E-Commerce Wizard doesn't support data imports, so you must manually type in product information. Estore has a Hot Deals page for highlighting sale items, but it doesn't offer other options for discounting or customizing product promotion. Like Bigstep.com, Estore will retain some customer information, but there is no customization for each shopper.

Estore's strength is its Web Hosting Control Panel, which puts development and administrative services under one roof. The features available for order processing are adequate but limited (each

MINDSPRING ESTORE DELUXE



From the country that brought you

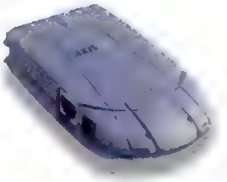


the Nobel Prize

the ball bearing

and Dancing Queen...

Sweden is proud to offer the Axis print server.



We Swedes have a long history of cultural and technical enlightenment. At Axis we carry on this tradition in our print servers. It seems we're doing quite well, as we just shipped our millionth unit. It's no wonder. An Axis print server simplifies the installation, access, and management of shared print resources across all networks. It works with virtually every major protocol, so it's appropriate for any network. And it installs easily, connecting directly to your printer's parallel port. So, while solving the larger problem of file server bottlenecks, you can also immediately reap cost and administrative time savings.

Visit www.axis.com/abba or call 1-800-444-AXIS and register to win a FREE Axis print server. And experience some Swedish innovation for yourself. And you thought ABBA was cool!

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Other Storefront Solutions

Below are some additional storefront sites, most of which will have limited appeal, but one may have that unique feature that's just what you're looking for.

Compaq eZstore

$39.95/month for 50 items (maximum), plus $100 setup fee.

Compaq ezStore's 12-step setup program is fabulously simple thanks to logically sequenced wizards. It quickly and elegantly guides you through setting up categories for your merchandise, uploading image files, and so on. In addition, you can choose to make your store a business-to-consumer or business-to-business store. By choosing the latter, you'll be able to accept purchase orders from established business customers.

However, Compaq's pricey solution offers templates and design options that are downright ugly. And if you want to do any type of formatting to liven up the look, you'll need to know some basic HTML. Also, this site doesn't automatically register keywords with the major search engines. **(Compaq Computer Corp.; 800-336-0611, 281-370-0670; www.compaq.com/smb/onlineservices.)**—*SLRW*

Lycos Merchant Center ShopSite

$99/month. Tax software: $0.05 per transaction.

Thanks to its Open Market Internet storefront software (*www.openmarket.com*), ShopSite's order processing and store maintenance are among the strongest we've seen. You get many of the benefits of this ultra-high-end package at a lower rate because Lycos is spreading the cost among many stores. You will also get the benefits of the Lycos Shopping community, which include access to your store through a major portal and listing your products on the Lycos search engine.

But Lycos's page templates produce a storefront that looks just like all the other Lycos stores. And not everybody will be happy with this look and feel (one font, no tables, few graphics). Additional visual improvement requires HTML programming, and Lycos lacks a WYSIWYG development tool. **(Lycos Inc.; 781-370-2700; www.lycos.com/shopnet.)**—*NK*

MerchandiZer

$79.95/month for up to 100 items, plus $149 setup fee.

MerchandiZer is clearly aimed at companies with larger catalogs. A credit company merchant account is free, but transaction costs are, of course, extra. The service is richer than many others, with multilingual versions and non-U.S. transaction and payment capabilities. MerchandiZer works in conjunction with a range of accounting programs, and its shipping features allow order tracking through UPS's tracking system. MerchandiZer is meant for those for whom the free services don't offer enough control. **(HipHip Software; 800-636-6343, 305-819-8111; www.merchandizer.com.)**—*NR*

SecureMerchant Pro

$99.95/month for up to 250 items.

SecureMerchant Pro's five-step setup process makes it remarkably simple to get the basics of your store built. In addition, the product has some highly sophisticated functions, such as the ability to reconcile your online sales with your accounting system and your inventory database. Also, SecureMerchant Pro has excellent product promotion features and lets you import your product database, a potentially time-saving measure.

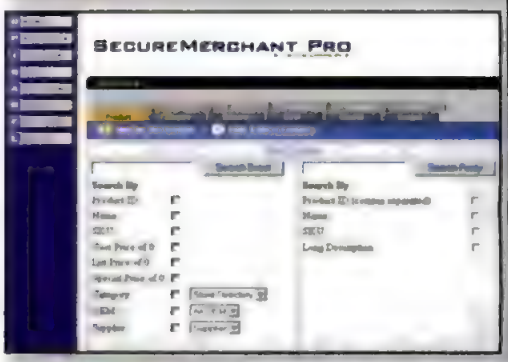
The five-click process may get you up fast, but you'll need to devote extra time to figuring out SunCommerce's powerful but many-layered store-building software. Also, SunCommerce gives you a choice of only two clunky storefront templates. **(SunCommerce Corp.; 888-634-7366, 604-801-6097; www.suncommerce.com.)**—*SLRW*

Virtual Spin Internet Store

$49.95/month for up to 100 items.

At press time, Virtual Spin was upgrading to its 5.0 software version, but what we reviewed was still a strong store solution, with more features than the free sites have, and it's less expensive than the more popular Yahoo! Store. Sign-up is fast and includes—if you wish—domain name registration or modification.

You get only an hour of live tech support with your site, but Virtual Spin's helpful manuals are downloadable. You can register with CyberCash, track orders through order numbers, import your catalog databases, generate useful sales reports, and more. The software calculates tax and shipping at order time; tax tables are updated automatically, and you can create unique shipping tables for individual parts. It isn't free, and building a store with it takes a while, but Virtual Spin is a very good solution. **(Virtual Spin Inc.; 888-853-5600, 425-974-1100; www.virtualspin.com.)**—*NR*



A store built with Lycos Merchant Center ShopSite (top) can include a search feature, as can one built with SunCommerce SecureMerchant Pro (middle). Compaq's eZstore (bottom) features numerous methods for sales promotions, such as cross-selling.

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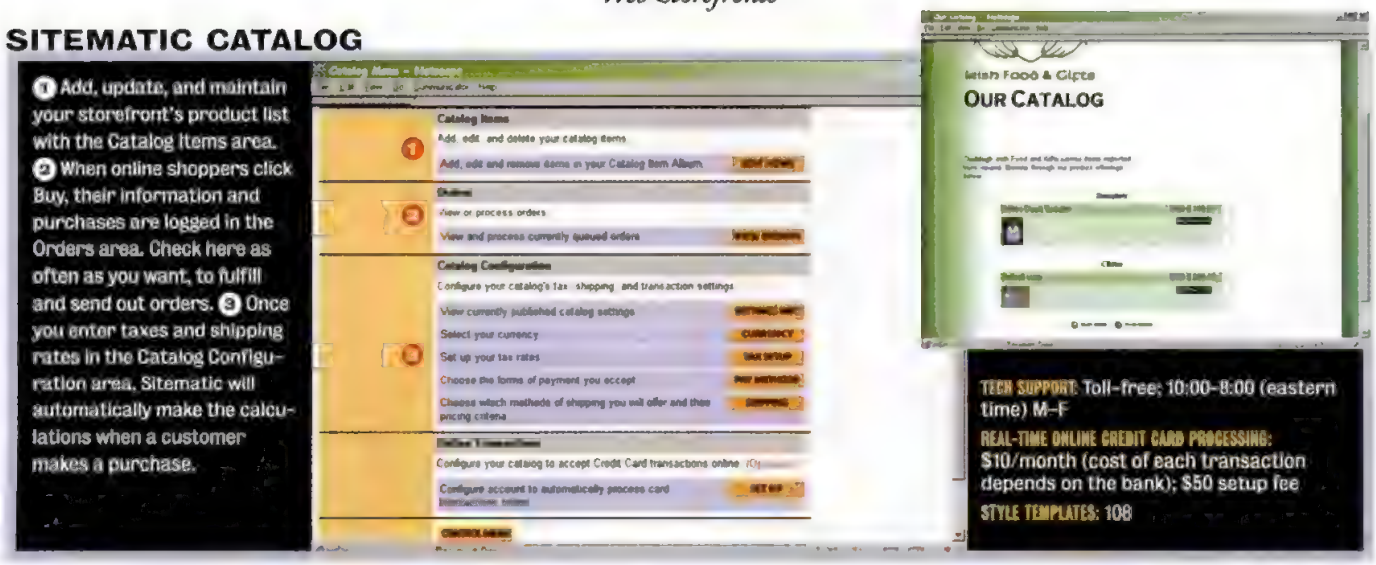
SITEMATIC CATALOG



shipper can only be assigned a single rate, for example). Analysis for both the site and the store is quite good (reporting site hits, product hits, and orders), though it is not as sophisticated as iCat's.

To become a viable e-commerce solution, MindSpring should better integrate the Web site and storefront, add more design flexibility, and expand the features for promoting sales. As it stands now, Estore Deluxe is a relatively pricey service that offers few advantages.—*NK*

Sitematic Catalog

$49.95/month for a 50-item store; Sitematic Corp., San Diego; 619-455-3600; www.sitematic.com.

● Targeted primarily at very small businesses, Sitematic boasts some of the best storefront creation features in our roundup. It gives useful promotion features, like letting merchants seamlessly push their products out to eBay (a feature offered by freemerchant.com 2.0 as well). But Sitematic falls behind when it comes to sales reports. In addition, your Sitematic store can grow to only 100 items and must be either 12 or 25 pages.

To start a site with Sitematic, you simply register and fill out an information form that is used to populate the store's home page; pick a service plan; choose one of the 108 design templates (you can always switch templates later); and enter your own text. Sitematic provides terrific help tips embedded in the storefront creation software.

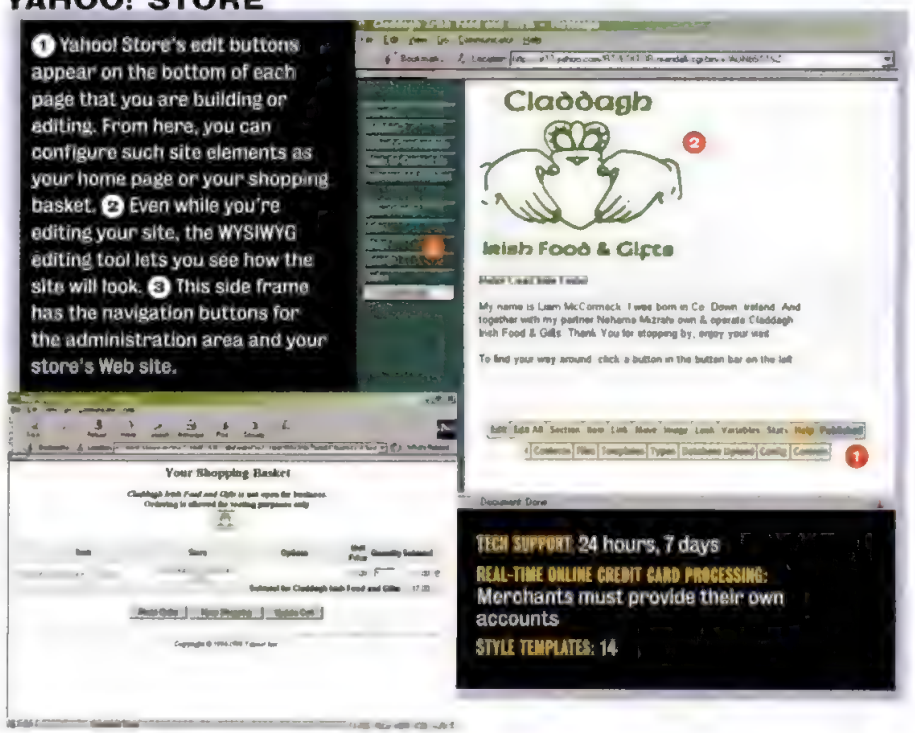
Before you can begin inputting graphics and catalog images, you are given a walk-through, and if you have an image, such as a logo, that is meant to be seen throughout the Web site, you must add it to the graphics library first. You can add product pictures directly to their respective catalog sections, but you have to add product information manually because Sitematic does not import data files.

When you input your product information, Sitematic offers an easy way to auction your products on eBay: Just click a box in the add product area and a form (similar to the one on the actual eBay site) pops up for you to fill out. This form enables eBay to point to your product and your storefront. (To take advantage of this, you need to have an account with eBay.)

Configuring taxation and shipping in the Catalog Management section is easy. In this same section, Sitematic offers a real-time online credit card processing option through CyberCash. This particular offering doesn't include the procurement of an Internet merchant account, but Sitematic will help you set one up online. Catalog Management also includes sales reporting functions, which only provide the viewing and the processing of orders.

Sitematic's solution isn't particularly compelling when you factor in the price. But Sitematic's ease of use, well-designed software, and handy features, such as the eBay promotion tool, may interest you.—*SLRW*

YAHOO! STORE



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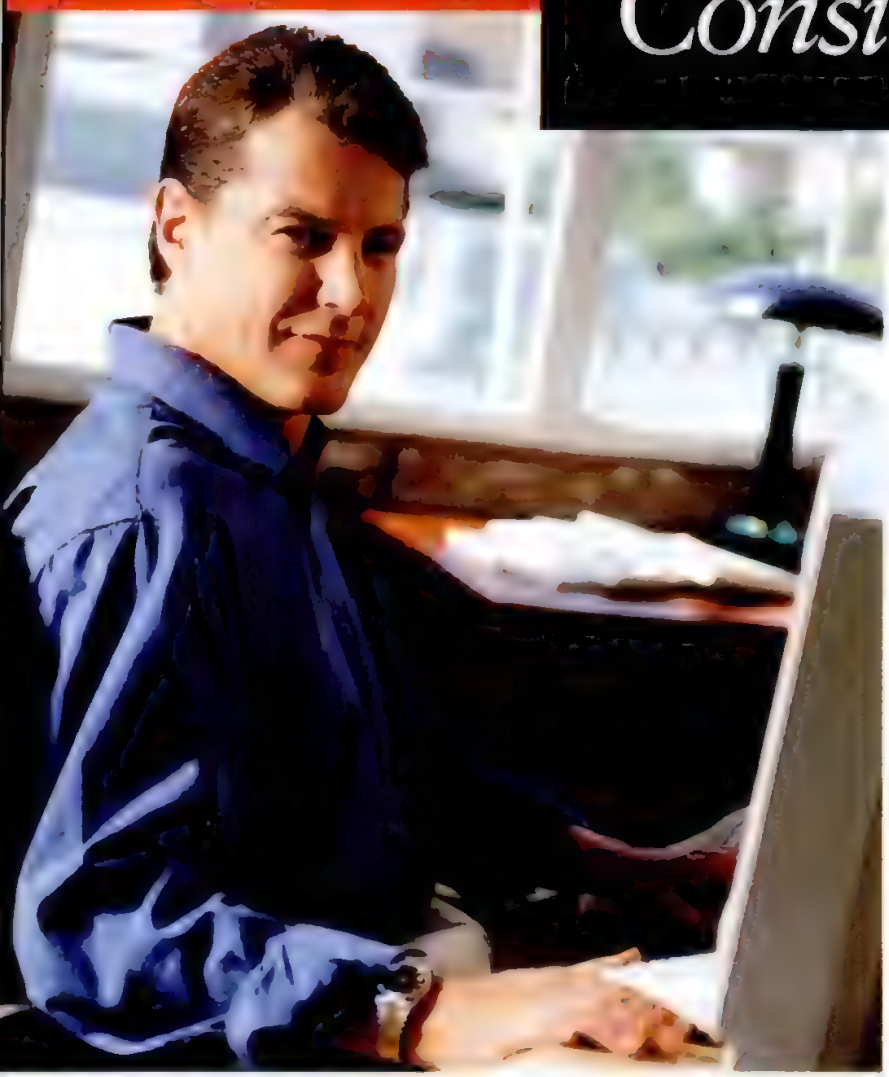

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Web Storefronts

■ YES □ NO	Bigstep.com	eCongo.com	freemerchant .com 2.0	IBM HomePage Creator	iCat Commerce Online	MindSpring Estore Deluxe	Sitematic Catalog	Yahoo! Store
		PC MAGAZINE EDITORS' CHOICE	PC MAGAZINE EDITORS' CHOICE					
Price per month	Free	Free	Free	50 items and 15 pages, $69.95	50 items, $49.95	100 items, $109	50 items and 12 pages, $49.95	50 items, $100
Real-time credit card validation	$14.95/month plus $0.20 per transaction	$39.95/month plus $0.30 per transaction	N/A	N/A	$45/month plus $0.35 per transaction; setup fee, $300	100 transactions, $35/month; each additional transaction, $0.50	$10/month; setup fee, $50	N/A
STORE DESIGN TOOLS								
Includes Web authoring tool/style templates	□■	□■	■■	■■	□■	□■	□■	■■
Uses wizards	■	□	■	■	■	■	□	■
Merchant can create forms	■	□	□	□	□	□	□	□
Merchant can import data files	□	□	■	□	■	□	□	■
Supports unlimited product categories	■	■	■	■	■	■	■	■
Offers product searches	□	□	□	□	■	■	□	■
Merchant can create navigational controls	■	□	■	■	■	■	□	■
Merchant can add pages to site	■	■	■	■	■	□	■	■
Maximum number of products	Unlimited	Unlimited	Unlimited	500	3,000	100	100	Unlimited
Supports individual product promotion/ site promotion	■■	■■	■■	■■	■■	■■	■■	■■
ORDER PROCESSING								
Calculates tax and shipping	■	□	■	■	■	■	■	■
Retains customer information	■	□	■	□	■	■	□	■
Retains session information	□	□	■	□	■	□	□	■
Tracks inventory	□	□	■	□	■	□	□	□
Provides customer e-mail confirmation	■	■	■	■	■	■	■	■
Provides merchant e-mail notification	■	■	■	■	■	■	■	■
Merchant can review orders online	■	■	■	■	■	■	■	■
Merchant can search orders	■	□	■	■	□	■	□	■
Merchant can filter orders	■	■	■	■	■	■	□	■
ADMINISTRATION AND REPORTING								
Can create sales/site reports	■■	■□	□■	■□	■□	■■	□□	■■
Can export data files	■	□	■	□	■	□	□	■

N/A—Not applicable: Merchants must set up their own accounts.

Yahoo! Store

$100/month for 50 products. Yahoo! Inc., Santa Clara, CA; 408-616-3801; store.yahoo.com.

●Yahoo! Store has garnered strong reviews since its inception, and its quality hasn't deteriorated. What Yahoo! Store has is its claim to good pricing. Given the influx of free storefront services, it's harder than before to recommend a service that costs $100 per month for 50 items. But Yahoo! Store does offer some special promotional tools and reporting features that might make it worth the price to some.

Yahoo! claims that you can create a store in 10 minutes, but what you get is a small store with a cookie-cutter design; creating a well-designed store with a substantial catalog takes much longer. From any page you can add an unlimited number of sections and subsections. Each item you add can have an extensive description, and drop-down lists that can show various sizes, colors, and so on. Furthermore, you can associate a large photo or thumbnail graphic with each item.

The store-building system lets you specify individual pricing, sale pricing, and quantity pricing; and, uniquely, the shopping basket design tool lets you suggest related items to a customer making a purchase. Not only does the site let you list special discounts and sales, but it will automatically add your site to the Yahoo! search engine under the proper category. Also, you can arrange to have your products listed on Yahoo! Auctions (instead of at eBay, as do freemerchant.com 2.0 and Sitematic).

Advanced features include the ability to import a CSV formatted database holding product information. For control over the design, the store builder includes a proprietary scripting language, which you can use for design and CGI scripts. Additionally, Yahoo! Store provides unique and useful statistics features, such as tracking the mouse-click origins and paths taken by your visitors. Other activity and tracking reports, as well as the number of orders per customer for a specified period of time, are also available.

The initial intuitiveness of the site builder system decreases as your site grows more complex, and the editor has significant difficulties with caches—to such a degree that you sometimes have to log in anew to get the right pages and dialogs to appear. But given a storefront service that offers a strong community for merchants, useful sales features, and a good reputation, constant intuitiveness is not a major issue.—*NR* PC

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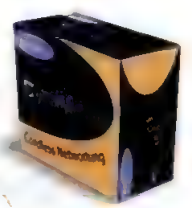

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DIGITAL CAMERAS

PC Magazine Labs tests 19 affordable digital cameras—and finds some excellent bargains for families or businesses.

By Daniel Grotta and Sally Wiener Grotta

Mirroring the well-established "better, faster, cheaper" computer paradigm, digital cameras have experienced an accelerated evolution that has propelled them from virtually useless curiosities to invaluable precision-capture devices. But the litmus test still remains: How do digital cameras compare with film cameras?

PC Magazine put 19 consumer-level digital cameras through a variety of tests and challenges, not only to see how well they performed relative to one another but also to test how well they stand up to film. All the cameras that we reviewed had charge-coupled devices (CCDs: small arrays of light-sensitive elements) of 1 megapixel or more, LCD viewfinders, macro capability, removable-media capability, built-in flashes, and street prices under $1,000. Nine of the 19 cameras tested broke the 2-million-pixel mark. And while 1-megapixel cameras are more than adequate for most homes and small businesses, photographers and enthusiasts will want to invest in a 2-megapixel model.

PC Magazine Labs not only subjected the cameras to the traditional performance tests but also had a panel of jurors analyze both print and Web photo output samples. After putting these cameras through their paces, our conclusion is clear: Their usefulness, economy, and versatility make them—at least for most families and businesses—superior to film. Here's why.

PHOTOGRAPHY BY THOM O'CONNOR

Digital cameras give you an impressive array of special features and modes that photographers could only dream about a few years ago. You can look at an image immediately after shooting it in the LCD viewfinder and know whether you got the photo you wanted. If not, you can shoot it over, because there are no film or processing costs. You can quickly upload images to your PC, but a number of cameras don't even require a computer—the $800 Panasonic PalmCam, for example, can transmit images by a CompactFlash (CF) modem plugged directly into the camera.

The Kodak DC280 comes with a relatively large 20MB CompactFlash card; if you want more storage, an IBM MicroDrive (340MB, $450 street) can store hundreds, even thousands, of images without reloading. That, plus the time-lapse and remote-control capabilities available on some cameras, makes them suitable for science, medical, nature, and surveillance work. Other digital cameras offer video, and some can record sound annotations with each frame. A number of cameras have panorama modes, manual controls, the ability to synchronize with an external flash, or burst modes for shooting up to 2 frames per second at full resolution. One camera, the Fujifilm MX-2900, offers interchangeable lenses. And of course, a digital camera is the fastest, easiest way to post graphics on the Web.

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IMAGE QUALITY

Equally important to the numerous features digital cameras offer, image quality is now—at least in most cases—on a par with that of film. For comparison this year, we shot a roll of film with a $400 Leica Mini 35-mm point-and-shoot film camera along with our digital cameras. The negatives and prints were processed locally, and the images were burned onto a Kodak Picture CD. According to traditional standards (crispness, dynamic range, contrast, focus), the Leica's negatives were of a significantly higher quality than those of any digital camera. But once the images were scanned and put on a Picture CD, our jury clearly preferred the artificially heightened colors of the digital images; the Leica would have ranked a middling 13th out of 20 if we had included it in our ranking. Similarly, the Leica's darkroom-generated prints were significantly better according to film-based standards of excellence, but our jury chose the brighter, less accurate colors of digital cameras.

As expected, the 2-megapixel cameras did better in print, but their larger CCD density did not automatically confer an advantage in our Web images. And once the user selects a higher-compression or lower-resolution setting, image quality degrades considerably. As a general rule, we recommend shooting the cameras in the best-quality mode.

Dramatic improvements in digital camera and ink jet printer technologies make it possible to generate gorgeous 8- by 10-inch prints that, to the untrained eye at least, are indistinguishable from film-based darkroom enlargements. This is not to say that digital camera images are automatically better than, or even as good as, comparable film-based prints. We observed various degrees of pixelization and noise in our digital camera ink

Our Contributors: BRUCE BROWN, DANIEL GROTTA, SALLY WIENER GROTTA, and M. DAVID STONE are contributing editors of *PC Magazine.* Associate editor JENNIFER TRIVERIO and PC Magazine Labs project leader S. JAE YANG were in charge of this story.

jet prints, mostly in output from the 1-megapixel models.

The quality differences among the top ten tested digital cameras were negligible. Our jurors rated the images mostly according to personal preferences; some jurors, for example, preferred a print that was algorithmically sharpened; others, one that had higher-contrast images or brightly saturated colors. Any camera could have been our top scorer, and except for the few cameras rated at the bottom, most could attain excellence with a little post-capture image editing.

What distinguishes the cameras from one another are the features they offer and their prices. It used to be that when a new generation of digital cameras hit the market—when VGA resolutions were outdated by SVGA and XGA resolutions, for example—the introductory price averaged between $800 and $1,000. Competition, volume production, and steadily decreasing component costs have eroded those prices considerably, with the average 2-megapixel digital camera selling for about $700. (We expect that most of the 3- and 4-megapixel cameras slated for introduction in 2000 will retail for $700 and under.)

Recognizing the reality that digital cameras are power hogs, about two-thirds of the vendors now bundle rechargeable batteries. The standard memory card size seems to be 8MB, though the Kodak DC265 and DC280 ship with 16MB and 20MB CF cards, respectively. The Casio QV-2000UX is the first consumer digital camera with a Type II CF slot, capable of accommodating an IBM MicroDrive, and the Panasonic PV-DC2590 PalmCam has two CF slots, for either a memory card and modem or two memory cards. The $700 Fujifilm MX-2700, the $600 Toshiba PDR-M4, and the Sony Cyber-shot DSC-F55 are small enough to slip into a pocket, and the Casio QV-8000SX comes with an 8X optical zoom. In addition, the Kodak DC265 and Minolta Dimâge EX Zoom 1500 incorporate the Digita operating system for easy navigation and customizable scripting. About one-third of the tested cameras had USB interfaces, and the rest (except for the Fujifilm MX-2700, which comes with a FlashPath floppy disk adapter) connect via serial ports.

Editors' Choice

- Kodak DC280
- Olympus C-2000 Zoom

PC MAGAZINE EDITORS' CHOICE

Image quality, features, and ease of use are the three most important considerations when you're selecting a digital camera. Of course, great battery life only adds to a camera's appeal. Of the 19 models we tested, we found two that exceed expectations.

Our Editors' Choice for families and small businesses is the Kodak DC280 ($690 street). Though the DC280 does not have the lowest price tag among the home-oriented cameras, we think that its image quality and uncluttered design is worth the premium. The DC280's output was ranked number one on both our Print Photo and Web Photo tests, with incredibly accurate colors, contrast, and exposure. Image details were especially crisp and clear.

The DC280 is a 2.1-megapixel camera with a top resolution of 1,760-by-1,168. It ships with a hefty 20MB CompactFlash card and has a battery life of 190 pictures per charge. Between its outstanding images and its ample features, the Kodak DC280 is a winner for its target market.

For enthusiasts or professional photographers, our Editors' Choice is the Olympus C-2000 Zoom ($900 street). The camera was rated fourth highest on our Print Photo test and second highest on our Web Photo test. Colors were rich, with a high amount of detail.

On this feature-rich camera, you always have the option of selecting the settings, from ISO to aperture and shutter speed. Of course, you can shoot in automatic mode, as well. The C-2000 produced a whopping 416 images from a set of batteries, far outdistancing the field.

Honorable mention goes to the Sanyo VPC-Z400 ($700 street), an ideal choice for business professionals looking to take high-quality pictures with an easy-to-use camera.

SNAPSHOT OF THE FUTURE

Unfortunately, the trade-off we have to make for all this power, image quality, and versatility—as well as these lower prices—is that using digital cameras has become even more complicated. Manufacturers continue to pile on so many features that you venture out of default mode at your peril. The lack of standard icons, controls, and menus only adds confusion. Battery power, although significantly improved from two years ago, is still too short. A camera should have enough power to be able to shoot all day; most cameras could improve performance time with larger memory buffers and better analog-to-digital converters.

Do megapixel digital cameras spell the death of film? Not yet, but the handwriting on the wall is clear: Industry experts project that by 2006, the only people who prefer film cameras will be those who want the cheap, ultrasimple, single-use disposable cameras and professional photographers who want to create certain effects that they feel only film allows. It

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was a long time coming, but digital is finally beginning to ace film out as the medium of preference for capturing and storing your precious images.

Agfa ePhoto CL30, CL50

CL30: 1,152 x 864, CompactFlash. $400 street. **CL50:** 1,280 x 960, SmartMedia. $600. Wilmington, MA; 888-281-2302; www.agfa.com.

● Each of Agfa's cameras concentrates on the most important area for its intended audience—ease of use for the Agfa ePhoto CL30 and picture quality for the ePhoto CL50—and each is a reasonable if not overwhelmingly exciting choice.

The CL30, intended for entry-level users and the SOHO market, is distinguished by its EasyPilot button, a combination wheel and button. Instead of pushing buttons, you turn the wheel to move through menu choices and press it to make a choice. While similar in concept to pressing buttons, this is a lot faster and easier to use. It also helps that the menus are easy to decode, with icons that offer text as well as pictures.

The cameras in Agfa's ePhoto line are inexpensive and have some great features.

The CL30's output sample was a little dark, which explains the camera's 13th place rank on both our Print Photo test and our Web Photo test. Otherwise the image was excellent, and we did not see the same dark cast as in other pictures we took. More troublesome was that the CL30 managed only 64 shots with standard double-A batteries, putting it near the bottom of the heap on our Battery Life test. But if battery life isn't an issue for you, this camera is worth considering, because its ease of use makes up for a slight loss of image quality under our jury tests' specific conditions.

The CL50, which targets business people such as insurance professionals and real estate appraisers (as well as technology enthusiasts), is slightly bigger and heavier than the CL30. Like some other cameras, including the Epson PhotoPC 750Z, it can open a panel to use sunlight to illuminate the LCD image, a technique that extends battery life and improves the visibility of the image, although the image still looks washed out in bright sunlight. Alas, the LCD menu is not as easy to use as that of the CL30. Not only does it have buttons instead of the CL30's innovative wheel, but it has a number of obscure icons.

Whatever points the CL50 loses for its menu system it gains back for its image quality. On our jury tests, it earned sixth for its print photo image and fourth place for its Web photo image. Depending on your taste, you might even like its sample picture better than the one that earned the top score on our tests. Though the camera managed a relatively low 123 shots on our Battery Life test, it's worth noting that the CL50 is less expensive than some other cameras that offer much the same image quality. And that makes it a more than reasonable choice if image quality is your prime concern.—*M. David Stone*

Canon PowerShot A50

1,280 x 960, CompactFlash. $500 street. Lake Success, NY; 800-652-2666; www.usa.canon.com.

● Canon succeeds very well in hitting its target markets—home and small-business users—with the Canon PowerShot A50. Almost small enough to hide in your hand, this inexpensive camera is simple to use and captures serviceable images for nondemanding applications. It's certainly good enough for Web posting, e-mail attachments, or family shots—but not quite good enough for framing or careful scrutiny.

The PowerShot has both an optical viewfinder and a 2-inch LCD that we found bright enough for outside use. Although the camera control arrangement and markings were sufficiently clear to let us take photos in fully automatic mode, we found we needed to refer to the manual for information on using all of the unit's features. Two items of note that add to the PowerShot's convenience are a 15-exposure, continuous-shot mode (which captures images in 640-by-480 resolution) and an on-screen aid for taking panoramic shots that displays the previously taken shot to assist in lining up successive ones.

The Canon PowerShot A50, however, was one of the lowest-ranked units on our jury tests for both printed photo and Web photo output. In its highest-resolution, lowest-compression mode, the PowerShot's printed output was not as clear as that of the other cameras and lacked the three-dimensional quality most of the other units achieved.

The Canon PowerShot A50 is an adequate choice for shots of family gatherings because of its small size, convenient design, and reasonable price. Its portability also makes it a good fit for general-purpose business applications.—*Bruce Brown*

Casio QV-2000UX, QV-8000SX

QV-2000UX: 1,600 x 1,200, CompactFlash. $900 street. **QV-8000SX:** 1,280 x 960, CompactFlash. $700. Dover, NJ; 800-752-0900; www.casio.com.

● Casio's cameras try to offer something for everyone, but in the process they miss some obvious details. The feature-packed Casio QV-2000UX is sure to score high with business users who need time-lapse capability or who shoot hundreds of images per session, but a high price, complexity, and a spartan driver may hamper consumers. The Casio QV-8000SX offers true telephoto capabilities, as well as a host of semiprofessional functions and features, but the lack of an optical viewfinder makes it difficult to use in bright light, despite an oversize LCD viewfinder.

PC MAGAZINE EDITORS' HOT LINKS

www.pcmag.com/hotlinks

These sites present just a few places to start your lifelong love affair with filmless photography.

➤Digital Photography Exhibit
www.bradley.edu/exhibit
See what others are doing with their digital cameras in this long-running nationwide contest.

➤PC Photo Forum
www.pcphotoforum.com
This site provides news, comparisons, and price guides for many models and accessories.

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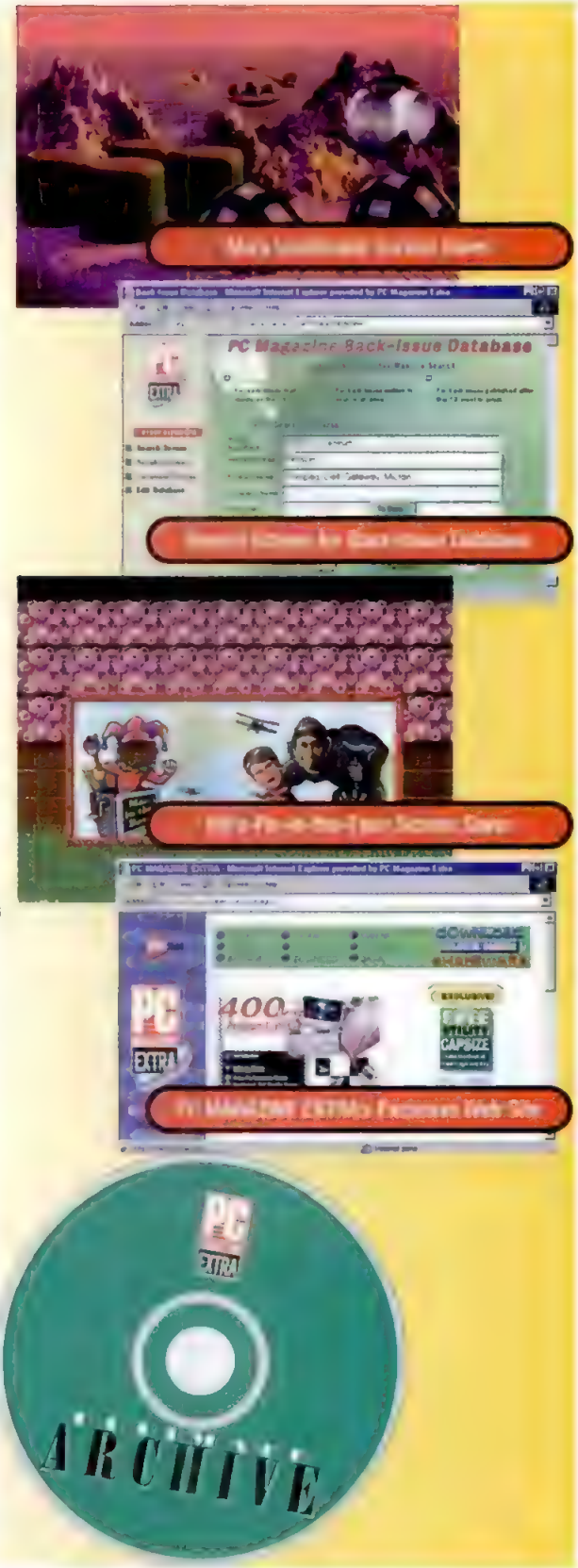

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For the **family use** rating, the issues we take into account for each camera are cost, simplicity, fun, image quality, and the software bundle. The **business use** rating focuses on good image quality in auto mode, memory capacity, cost of media, and software included for Web posting. For **prosumer (semiprofessional) use** we consider image quality, advanced adjustments, speed, ruggedness, and the quality of the macro mode. We rate all of these characteristics in terms of ease of use and power.

	Family use		Business use		Prosumer (semiprofessional) use	
	Ease	Power	Ease	Power	Ease	Power
Agfa ePhoto CL30	Excellent	Good	Excellent	Good	Excellent	Fair
Agfa ePhoto CL50	Good	Good	Good	Good	Excellent	Fair
Canon PowerShot A50	Good	Good	Good	Good	Fair	Poor
Casio QV-2000UX	Good	Excellent	Good	Excellent	Good	Good
Casio QV-8000SX	Fair	Excellent	Good	Excellent	Good	Good
Epson PhotoPC 750Z	Good	Excellent	Good	Excellent	Excellent	Good
Epson PhotoPC 800	Excellent	Good	Excellent	Excellent	Excellent	Good
FujiFilm MX-2700	Good	Good	Good	Good	Fair	Fair
FujiFilm MX-2900	Fair	Fair	Good	Good	Good	Good
HP PhotoSmart C200	Good	Fair	Fair	Fair	Poor	Poor
Kodak DC265	Good	Good	Good	Excellent	Fair	Good
Kodak DC280	Good	Excellent	Good	Excellent	Fair	Good
Minolta Dimâge EX Zoom 1500	Fair	Good	Good	Excellent	Good	Fair
Nikon Coolpix 950	Good	Good	Good	Good	Good	Good
Olympus C-2000 Zoom	Fair	Good	Good	Excellent	Excellent	Excellent
Panasonic PV-DC2590 PalmCam	Good	Good	Good	Excellent	Good	Fair
Sanyo VPC-Z400	Good	Excellent	Excellent	Good	Excellent	Good
Sony Cyber-shot DSC-F55	Good	Good	Good	Good	Good	Fair
Toshiba PDR-M4	Excellent	Good	Excellent	Good	Excellent	Fair

The QV-2000UX looks, feels, and handles much like a point-and-shoot film camera. Sliding a metal plate away from the lens turns the camera on and moves the lens into position. But when you close and turn off the unit, the cover invariably hits the lens mount, and this may eventually cause wear. Among its many features, the camera provides automatic and semi-manual functions, time-lapse photography, and an excellent panoramic mode. What makes the QV-2000UX particularly valuable for high-volume shooters is the Type I/II CF card slot: Add a 320MB IBM MicroDrive and you can store up to 400 full-resolution images.

Our jury ranked the QV-2000UX's image quality a respectable eighth out of 19 cameras. Detail was excellent except in dark shadow areas, and the flash provided consistent, pleasing illumination. Colors were accurate though slightly muted on our Print Photo tests and slightly washed out on our Web Photo tests.

The QV-8000SX is a handsome, well-balanced unit that you can operate as a fully automatic or completely manual camera; this includes adjusting the f-stops, shutter speeds, three metering modes, and the focus. Its wireless remote, combined with the camera's time-lapse capability, makes it perfect for nature photography and surveillance work.

Despite the very accurate color of its images, our jury didn't rate the QV-8000SX's print image quality very highly. There was a slight falloff of light on the right edge, little detail in the shadowy areas, and some blooming (white halos) around objects. The Web image displayed aliasing and pixelization consistent with its relatively low resolution.

Demanding users in need of some special features should check out Casio's offerings; but be prepared for some noticeable shortcomings. The QV-2000UX is a versatile tool, but it is overendowed and overpriced as a consumer camera. And although the QV-8000 SX is feature-laden, it can be frustrating and time-consuming to use.—*DG and SWG*

Epson PhotoPC 750Z, 800

750Z: 1,600 x 1,200, CompactFlash. $600 street. **800:** 1,984 x 1,488, CompactFlash. $700. Long Beach, CA; 800-463-7766; www.epson.com.

● Epson's two cameras are both very much worth considering. The PhotoPC 750Z is aimed at the education and home markets, while the Epson PhotoPC 800 more closely targets photo enthusiasts.

The 750Z is a tad heftier than a typical 35-mm point-and-shoot camera. It's also harder to learn. Expect to spend time with the manual if you want to understand all the menu choices and control buttons. Like the Agfa ePhoto CL50, the 750Z has a small panel that opens so sunlight can illuminate the LCD image. The LCD still washes out in very bright sunlight, but the feature is an improvement over the camera's backlight.

Our jury put the 750Z's picture quality in tenth place for both print photo and Web photo output, but there were no real problems with the output. Other shots we took also offered image quality that ranged from good to excellent. The camera managed 222 shots—about average—on our Battery Life test using the included rechargeable nickel hydride batteries. But there's no question that this camera hits its target market.

The Epson PhotoPC 800 is smaller and lighter than most 35-mm point-and-shoot cameras. It's also unusual in that it offers a choice between automatic, programmed, and manual modes. In programmed mode you can choose from four settings for different types of pictures and change a few basic settings like sensitivity (the digital equivalent of film speed). In manual mode you have complete control over all settings, such as shutter speed and aperture size. Most important is that even with all these settings available, the 800 is easy to use, thanks to well-designed menus.

The 800's image quality earned it third place on our jury tests for print photo output and a still-respectable 11th place for Web photo output. It turned out similarly high-quality images for other pictures we took, both inside and outside, under a variety of lighting conditions. The camera managed just 73 shots on our Battery Life tests, but that's because it uses only two batteries at a time, even though it comes

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SUMMARY OF FEATURES

Digital Cameras

Continued

■ YES □ NO
Products listed in review order

	Agfa ePhoto CL30	Agfa ePhoto CL50	Canon PowerShot A50	Casio QV-2000UX	Casio QV-8000SX	Epson PhotoPC 750Z	Epson PhotoPC 800	Fujifilm MX-2700	Fujifilm MX-2900	HP Photo-Smart C200
Street price	$400	$600	$500	$900	$700	$600	$700	$700	$900	$300
Dimensions (HWD, in inches)	3.2 x 5.1 x 1.5	2.9 x 5.1 x 2.2	2.7 x 4.1 x 1.5	2.9 x 5.1 x 2.4	3.1 x 5.6 x 2.8	3.0 x 5.4 x 2.4	2.7 x 4.4 x 1.6	3.1 x 3.8 x 1.3	2.7 x 5.1 x 2.4	2.1 x 5.0 x 3.1
Weight	9 ounces	11 ounces	9 ounces	11 ounces	11 ounces	11 ounces	8 ounces	9 ounces	12 ounces	11 ounces
Optical/digital zoom level	N/A / 2X	3X / 2X	2.5X / N/A	3X / 2X	8X / 2X–4X	3X / 2X	N/A / 2X	N/A / 2.5X	3X / 2.5X	N/A / 2X
Equivalent 35-mm camera lens	Info not available	34–102 mm	28–70 mm	36–108 mm	40–320 mm	34–102 mm	38 mm	35 mm	35–105 mm	39 mm
LCD viewfinder (diagonal measurement)	2.0 inches	2.0 inches	2.0 inches	1.8 inches	2.5 inches	2.0 inches	1.8 inches	2.0 inches	2.0 inches	1.8 inches
Closest focus (macro mode)	7.8 inches	7.8 inches	6.7 inches	7.8 inches	0.04 inches	8.0 inches	5.9 inches	3.5 inches	9.8 inches	9.5 inches
Best resolution	1,440 x 1,080	1,600 x 1,200	1,280 x 960	1,600 x 1,200	1,280 x 960	1,600 x 1,200	1,984 x 1,488	1,600 x 1,200	1,600 x 1,200	1,152 x 872
Total number of pixels	1.5 million	1.9 million	1.3 million	2.1 million	1.3 million	1.3 million	2.1 million	2.3 million	2.3 million	1.0 million
Compression modes	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG, TIFF	JPEG
Removable memory shipped with camera	4MB CompactFlash	8MB SmartMedia	8MB CompactFlash	8MB CompactFlash	8MB CompactFlash	12MB CompactFlash	8MB CompactFlash	8MB SmartMedia	8MB SmartMedia	8MB CompactFlash
Image capacity: standard/best quality	36 / 6	96 / 12	14 / 8	39 / 8	63 / 13	178 / 16	120 / 10	35 / 8	35 / 8	80 / 17
Video capture	■	■	□	■	■	□	□	■	■	□
Batteries included	4 AA	4 AA	1 lithium ion	4 AA	4 AA	4 nickel hydride	4 nickel hydride	1 lithium ion	1 lithium ion	4 AA
Rechargeable	□	□	■	□	□	■	■	■	■	□
Bundled software	Agfa PhotoGenie, Agfa PhotoWise	Agfa PhotoGenie, Agfa PhotoWise	PowerShot Solutions	Media Center, Panorama Editor	Media Center, Panorama Editor	Image Expert	Image Expert	Adobe PhotoDeluxe Home Edition	Adobe PhotoDeluxe Home Edition	HP Photo Imaging
Companion printer type (and list price)	None	None	Dye sub ($499)	Dye sub ($199)	Dye sub ($199)	Ink jet ($179–$500)	Ink jet ($179–$500)	None	None	Ink jet ($499)
Works directly from camera	N/A	N/A	■	■	■	■	■	N/A	N/A	■

N/A—Not applicable: The product does not have this feature.

with four rechargeable double-A batteries. Ultimately, the combination of high-quality images in automatic mode with the option to use full manual control makes this a very attractive choice for advanced photographers.—*MDS*

Fujifilm MX-2700, MX-2900

MX-2700: 1,800 x 1,200, CompactFlash/SmartMedia. $700 street. **MX-2900:** 1,800 x 1,200, CompactFlash/SmartMedia. $900. Elmsford, NY; 800-800-3854; www.fujifilm.com.

● Fuji Photo Film U.S.A. offers a pair of 2.3-megapixel cameras that ably cover the midrange of digital photography needs. The Fujifilm MX-2700 is intended for users who want the latest technology in a high-quality compact camera at a consumer price, with secondary markets in small businesses and Web site development companies. Trading high-end features for a shirt-pocket size, the MX-2700 is a stunning demonstration in technology. The Fujifilm MX-2900 targets advanced amateur or professional photographers already familiar with digital imagery who are seeking a lower-end professional camera. The MX-2900's ability to accept extra lenses and flash attachments make it an appealing choice for anyone who wants to switch from 35-mm photography.

The 9.0-ounce, 3.8- by 3.1- by 1.3-inch MX-2700 fits easily in a shirt pocket, which is its most appealing feature beyond a high pixel count. You can capture images in full automatic mode or, with a single twist of a dial, enter the manual mode, in which you can set white balance and exposure settings. You can also enable continuous-image mode: three frames per second in nine-image bursts, with an image review before saving so that you can quickly delete unwanted shots.

The user interface—both the dials and the LCD menu system—requires some learning time, but the effort is well spent, and with practice you can quickly switch the MX-2700's settings. Image quality was rated in the lower half of the field by both juries, but users will still be very pleased with the output.

For those who don't mind carrying around a camera that's a bit larger, the Fujifilm MX-2900, which roughly resembles a 35-mm SLR camera, is a fine choice. To the MX-2700's lens and basic technology, the camera adds a 3X optical zoom, a flash hot shoe, a Slow Synchro flash mode to capture images in low light,

Both of these Fuji cameras offer high-end features for home users, small businesses, or professional photographers.

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SUMMARY OF FEATURES

Digital Cameras

Ends

■ YES □ NO Products listed in review order	Kodak DC265	Kodak DC280	Minolta Dimâge EX Zoom 1500	Nikon Coolpix 950	Olympus C-2000 Zoom	Panasonic PV-DC2590 PalmCam	Sanyo VPC-Z400	Sony Cyber-shot DSC-F55	Toshiba PDR-M4
Street price	$760	$690	$510	$1,000	$900	$800	$700	$800	$600
Dimensions (HWD, in inches)	4.2 x 4.6 x 2.2	3.0 x 5.2 x 2.0	2.3 x 5.0 x 2.7	5.6 x 3.0 x 1.4	2.9 x 4.2 x 2.6	2.7 x 4.7 x 2.0	2.2 x 5.0 x 2.8	3.1 x 4.1 x 2.0	2.7 x 4.4 x 1.6
Weight	19 ounces	12 ounces	11 ounces	12 ounces	10 ounces	10 ounces	11 ounces	10 ounces	8 ounces
Optical/digital zoom level	3X / 2X	2X / 3X	3X / 2X	3X / 2.5X	3X / 3X	3X / 2X	3X / 6X	N/A / 2.5X	N/A / 2X
Equivalent 35-mm camera lens	38–115 mm	30–60 mm	38–115 mm	38–115 mm	35–105 mm	34–102 mm	34–102 mm	37 mm	34 mm
LCD viewfinder (diagonal measurement)	2.0 inches	1.8 inches	2.0 inches	2.0 inches	1.8 inches	1.8 inches	2.0 inches	2.0 inches	1.8 inches
Closest focus (macro mode)	11.8 inches	9.8 inches	16.0 inches	0.8 inches	8.0 inches	7.9 inches	8.0 inches	1.0 inch	4.0 inches
Best resolution	1,536 x 1,024	1,760 x 1,168	1,344 x 1,008	1,600 x 1,200	1,600 x 1,200	1,280 x 960	1,280 x 960	1,600 x 1,200	1,600 x 1,200
Total number of pixels	1.6 million	2.1 million	1.5 million	2.1 million	2.1 million	1.3 million	1.3 million	2.1 million	2.1 million
Compression modes	JPEG, FlashPix	JPEG	JPEG	JPEG, TIFF	JPEG, TIFF	JPEG	JPEG	JPEG	JPEG
Removable memory shipped with camera	16MB CompactFlash	20MB CompactFlash	8MB CompactFlash	8MB CompactFlash	8MB SmartMedia	8MB CompactFlash	4MB SmartMedia	4MB Memory Stick	8MB SmartMedia
Image capacity: standard/best quality	190 / 28	245 / 32	38 / 3	16 / 1	122 / 7	100 / 15	60 / 8	15 / 8	20 / 8
Video capture	□	□	■	□	□	■	□	■	□
Batteries included	4 AA / 4 nickel hydride	4 AA / 4 nickel hydride	4 AA	4 AA	4 AA	4 AA	4 AA	1 lithium ion	1 lithium ion
Rechargeable	□ ■	□ ■	□	□	□	□	□	■	■
Bundled software	Adobe PageMill, Adobe PhotoDeluxe, Kodak Picture Easy	Adobe PageMill, Adobe PhotoDeluxe, ArcSoft PhotoPrinter	None	Hotshots (PictureWorks), IPIX, NikonView 2	Adobe PhotoDeluxe, QuickStitch	Adobe PhotoDeluxe	MGI PhotoSuite SE	Picture Gear 3.2	Image Expert, Image Shuttle
Companion printer type (and list price)	Ink jet ($149)	Ink jet ($149)	None	None	Dye sub ($449)	Dye sub ($600)	None	Dye sub ($599)	None
Works directly from camera	■	■	N/A	N/A	■	■	N/A	□	N/A

N/A—Not applicable: The product does not have this feature.

three metering modes, and multiframe playback to view as many as nine images at a time on the LCD screen. The MX-2900 can also accept 43-mm filters and 28-mm wide-angle lens attachments. With midrange jury ratings on both the Print Photo and the Web Photo tests, the MX-2900 is an impressive, facile device.

The bottom line in digital imagery is pixel count, which makes both Fujifilm cameras top choices in this year's roundup. Both are impressive performers.—*BB*

HP PhotoSmart C200

1,152 x 872, CompactFlash. $300 street. Palo Alto, CA; 800-752-0900; www.hp.com.

● The big story behind the HP PhotoSmart C200 is that you can actually buy a megapixel camera for $300. While the PhotoSmart produced printed photo and Web photo output that our juries ranked very low in quality compared with the other tested cameras, you've got to consider that most of them cost at least twice as much as the PhotoSmart. The no-frills design and rugged appearance make it a fine choice for a first digital camera for families or even small businesses. Intended to be an entry-level camera, the PhotoSmart hits its mark.

Though it has a low pixel count of 1.0 megapixels, which resulted in an unusual 1,152-by-872 resolution, the PhotoSmart does have a 2X digital zoom. While a digital zoom won't produce the same clear images as an optical zoom, any zoom at the PhotoSmart's price is a welcome surprise. We found the LCD viewfinder image a bit jumpy and slow in testing, but both the optical and LCD viewfinders were useful and useable. Unlike more compact cameras from other vendors that target entry-level or family users, the PhotoSmart was somewhat cumbersome and less convenient to carry on an everyday basis.

The camera's printed image output was ranked last by our jury, and the Web image was among the lower-rated ones as well. So if you're looking for top-level images or fancy filmwork, this isn't the camera to choose.

The HP PhotoSmart C200 offers a sturdy design, is simple to use, and won't break the budget, but its image quality was far outclassed by the output from the rest of the field.—*BB*

Kodak DC265, DC280

DC265: 1,536 x 1,024, CompactFlash. $760 street. **DC280:** 1,760 x 1,168, CompactFlash. $690. Rochester, NY; 800-235-6325; www.kodak.com.

The Kodak DC265 is designed for *prosumers:* knowledgeable amateurs who demand a high degree of versatility. The Kodak DC280 is perfect for families and SOHO users who want a very easy-to-operate, fast-shooting camera. And it delivers spectacular images.

In addition to a variety of useful features—including a focusable diopter on the optical viewfinder and the ability to sync with studio strobes—the DC265 incorporates the Digita operating system, which permits considerable customization. Menus and controls are quite easy to follow on the camera's grainy, jerky LCD, but the DC265's surfeit of buttons, levers, and other controls can intimidate new users. It also has a top shutter speed of 1/400th of a second—too slow for action shooting. And the mere 1.6-megapixel resolution may put off those who want bigger and better-

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PERFORMANCE TESTS

Digital Cameras

In print or on the Web, the Kodak DC280 produced images that were the overwhelming favorites among our jury. The Olympus C-2000 Zoom, however, was not far behind in image quality.

We subjected 19 digital cameras to the scrutiny of our discriminating jurors, who judged the cameras' photographs on their appearance in print and in a simulated Web environment, since many people use their digital cameras to capture images for posting on Web pages. The print medium favors higher optical (lens) and digital (CCD array) resolutions in cameras, while the Web environment is kinder to cameras that have a better dynamic range and pleasant color but not necessarily the best resolution.

In evaluating the print photographs, our jurors looked for fineness and accuracy of detail, brightness and contrast, and the natural colors one would expect from printed photographs. In simulating the Web environment, we let the jurors evaluate the same images downsized to 360-by-480 at 72 dpi. We had staged the target scene with a variety of elements that would highlight specific attributes of a photo, including optical resolution, color tendencies, and dynamic range. The jury image included a Macbeth color chart and wood grains so that jurors could look for gross color errors. But because the jurors were not asked to compare images against the original scene, the jury was not as concerned with the absolute accuracy of color. Instead, the jurors favored images with brighter, pleasing colors as long as the color cast was not noticeably unnatural. And because we used the camera's own flash, the color temperature of the bulb also significantly affected the color of the photographs.

On the Print Photo test, our jury thought the Kodak DC280 and Sony Cyber-shot DSC-F55 had the best output, closely followed by the Epson PhotoPC 800 and Olympus C-2000 Zoom. While the jury appreciated how brightly the Kodak captured the scene and how good its tonal range was, the Sony was rewarded for its accurate details. After the top four cameras (which stood out clearly in the eyes of our jury), the next ten were virtually equal to one another; their relative placement on each juror's scorecard depended mainly on individual taste.

When the images were viewed on-screen through a Web browser, the Kodak DC280 was the almost unanimous top choice. While this camera's resolving power was not as good as the Sony's, in the low-resolution viewing environment the Kodak's bright and pleasing colors won the jurors' hearts, and the Sony's accurate yet slightly less saturated color image fell to ninth place. Note that 12 digital cameras out of the 19 in this roundup were rated higher than a conventional Leica Mini film camera when the scanned photo was presented on a screen, simulating Web usage.

Last year, we recognized that digital cameras lag behind film cameras in battery efficiency. Because digital cameras capture and store images electronically, they use up batteries more rapidly. On our test, the Olympus C-2000 Zoom—powered by Olympus's rechargeable, 1.2V, 1,450-mAh nickel hydride batteries—shot slightly more than twice as many photos as the average. We saw no correlation between the type of battery and Battery Life test performance. Both the Toshiba PDR-M4 (with lithium ion rechargeables) and the Agfa ePhoto CL30 (using alkaline batteries) captured fewer than 100 shots. All the cameras powered by double-A batteries use four cells apiece—except the Epson PhotoPC 800 which, with only two battery cells, also took fewer than 100 shots.

In addition to the print and Web jury testing, and the Battery Life text, we performed objective image-quality tests for frame accuracy, noise level, and pixel transition (a resolution test). These results appear on our Web site at *www.pcmag.com/digicam99*.

—Analysis written by S. Jae Yang. Special thanks to Edward M. Granger for devising the Image Quality Test methodology and to Glenn Menin for his help with data analysis.

▼ **Photo Print** The Kodak DC280 and Sony Cyber-shot DSC-F55 were virtually tied at the top. The next ten cameras were very close in image quality, according to our jury.

Web Photo Our jury overwhelmingly favored the Kodak DC280's image on the Web. A conventional Leica Mini film camera would have placed 13th if included in this ranking.

Bold type denotes first place. ■ denotes Editors' Choice.

	Highest optical resolution	Battery Life (Number of shots)	Tested batteries	Rechargeable	Jury Tests: Print Photo (jury rank)	Jury Tests: Web Photo (jury rank)
Agfa ePhoto CL30	1,152 x 864	64	AA	No	13	13
Agfa ePhoto CL50	1,280 x 960	123	AA	No	6	4
Canon PowerShot A50	1,280 x 960	213	Proprietary	Yes	17	18
Casio QV-2000UX	1,600 x 1,200	162	AA	No	8	3
Casio QV-8000SX	1,280 x 960	215	AA	No	14	7
Epson PhotoPC 750Z	1,280 x 960	222	Nickel hydride	Yes	10	10
Epson PhotoPC 800	1,600 x 1,200	73	Nickel hydride	Yes	3	11
Fujifilm MX-2700	1,800 x 1,200	249	Proprietary	Yes	16	14
Fujifilm MX-2900	1,800 x 1,200	142	Proprietary	Yes	11	12
HP PhotoSmart C200	1,152 x 872	132	AA	No	19	15
Kodak DC265	1,536 x 1,024	161	Nickel hydride	Yes	7	8
■ Kodak DC280	1,760 x 1,168	190	Nickel hydride	Yes	1	1
Minolta Dimâge EX Zoom 1500	1,344 x 1,008	108	AA	No	15	16
Nikon Coolpix 950	1,600 x 1,200	151	AA	No	9	5
■ Olympus C-2000 Zoom	1,600 x 1,200	416	Nickel hydride*	Yes	4	2
Panasonic PV-DC2590 PalmCam	1,280 x 960	245	AA	No	12	17
Sanyo VPC-Z400	1,280 x 960	309	AA	No	5	6
Sony Cyber-shot DSC-F55	1,600 x 1,200	126	Proprietary	Yes	2	9
Toshiba PDR-M4	1,600 x 1,200	53	Proprietary	Yes	18	19

BETTER ▶

* The batteries we tested with the Olympus camera are part of an optional package

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Output Samples

Though output samples were generally of very high quality, there is still a noticeable difference between the output from a 1.3-megapixel camera, such as the Canon PowerShot A50, and that of a 2.3-megapixel camera, such as the [illegible]

Agfa ePhoto CL30

Agfa ePhoto CL50

Canon PowerShot A50

Casio QV-2000UX

Casio QV-8000SX

Epson PhotoPC 750Z

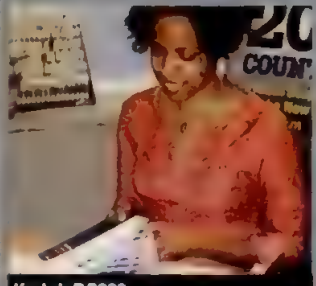
Epson PhotoPC 800

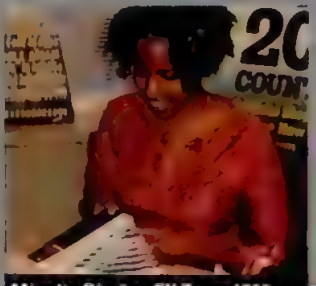
Fujifilm MX-2700

Fujifilm MX-2900

HP PhotoSmart C200

Kodak DC265


Kodak DC280


Minolta Dimâge EX Zoom 1500

Nikon Coolpix 950

Olympus C-2000 Zoom

Panasonic PV-DC2590 PalmCam

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looking pictures.

Our print photo was evenly illuminated, with intensely saturated though not unpleasing colors. Skin tones exhibited a magenta tinge; the Web photo was accurate, though flat. But because of the limited resolution, both the print and Web photos lacked detail and "snap."

We liked the Kodak DC280's speed and ease of use. Although it doesn't incorporate the Digita OS, the DC280's menu structure is very easy to use and customize. Everything is well marked and logically placed, but the number of buttons and controls may confuse a first-time user. The LCD viewfinder isn't very visible in bright sunlight. But playback mode is refreshingly rapid. Users can place attractive, downloadable borders around just-shot pictures (though once in place, they can't be removed later).

It's easy to snap on a zoom or remove the lens, thanks to Minolta's modular design.

Our jury voted the DC280's images the best in this roundup. Exposure and contrast were perfect, and except for a slight reddening of skin tones, colors were bang-on accurate. The DC280 was one of the few cameras to show detail in dark areas, such the contrast between our male model's black shirt and dark hair. Image detail was so crisp and clean that it was one of only a handful of prints in which we could read headline text on the *PC Magazine* poster. And the Web photo was nearly perfect.

The DC265 is a well-rounded camera that combines great ergonomics, good image quality, desirable features, and excellent value. Excellent image processing, a rapid response, and a wonderful user interface put the DC280 at the head of its class.—*DG and SWG*

Minolta Dimâge EX Zoom 1500

1,344 x 1,008, CompactFlash. $510 street. Ramsey, NJ; 800-752-0900; www.minoltausa.com.

● The Minolta Dimâge EX Zoom 1500 is an unusual, innovative camera that targets general consumers and business or professional users who would benefit from wide-angle coverage. Despite a modular design that attempts to avoid obsolescence by making everything—lens, CCD, firmware, and so on—interchangeable and upgradable, the Dimâge's image quality is below average.

There's a lot to like about the Dimâge. With an optional 3-foot cord, its 3X zoom lens can be tethered to the camera for overhead shots. The Dimâge uses the Digita OS, which allows for custom scripts, and its 16MB buffer gives it fast shooting and playback speeds.

We have minor quibbles with the unit's design. The CF card resides next to the battery compartment, so opening it may spill the batteries. And once the macro mode is invoked, you must turn it off before the lens can return to normal mode.

The Coolpix's movable lens lets you change angles with ease.

Our print photo test image revealed a number of problems. The overall color cast was warm, with a tendency towards red. It was slightly underexposed, with significant light falloff on the edges. Color was significantly better on our Web photo image and was less underexposed. On close inspection of both the print and Web photos, nothing was crisp or sharp.

The Dimâge is a specialty camera at a reasonable price. It is an excellent choice for users who need some unusual features, but general consumers can do better elsewhere.—*DG and SWG*

Nikon Coolpix 950

1,600 x 1,200, CompactFlash. $1,000 street. Melville, NY; 800-526-4566; www.nikonusa.com.

● Computer-savvy photographers who have used digital cameras and consumers looking for a high-quality choice from a top-name camera manufacturer are the target markets for the Nikon Coolpix 950. With its Nikkor lens, rugged design, and 3X optical zoom, the Coolpix is a fine choice for most applications, though its price will put it out of the reach of many families and small businesses. In jury testing, the camera was not a class leader, but it placed in the upper half of the tested cameras for both Web and printed photo images.

The Coolpix's lens swivels for self-portraits or to provide a range of viewing angles while composing and shooting. In addition to aperture-priority and shutter-priority exposure modes, one of the most valuable features is a Best Shot Selection mode, which automatically analyzes a series of shots and saves the clearest image. The camera is comfortable to hold, though two-handed operation is most comfortable, and both the optical and LCD viewfinders are a pleasure to use in a variety of lighting conditions. Optional telephoto, wide-angle, and fish-eye lens converters can enhance the camera's repertoire.

Another of the Coolpix's outstanding features is the 0.8-inch focusing in macro mode, which enables the unit to be used for all kinds of close-up work. In jury testing, color and detail capture were very good in the print image, but the overall resolution of the hard-copy image fell a bit behind that of the category leaders. An exciting camera with a wide range of powerful features, the Nikon Coolpix 950 is a good choice for most applications.—*BB*

Olympus C-2000 Zoom

1,600 x 1,200, SmartMedia. $900 street. Melville, NY; 800-622-6372; www.olympus.com.

PC MAGAZINE EDITORS' CHOICE

The Olympus C-2000 Zoom is an excellent buy, considering its price range and target market. It is intended for professional photographers who are just switching to digital or advanced computer users who want quality hard copies. Our jury put the C-2000 in fourth place for its print photo output and second place for its Web photo output, making it an excellent performer with convenient features and a fair price.

The C-2000 is bundled with Adobe PhotoDeluxe, Enroute Imaging's Quick-

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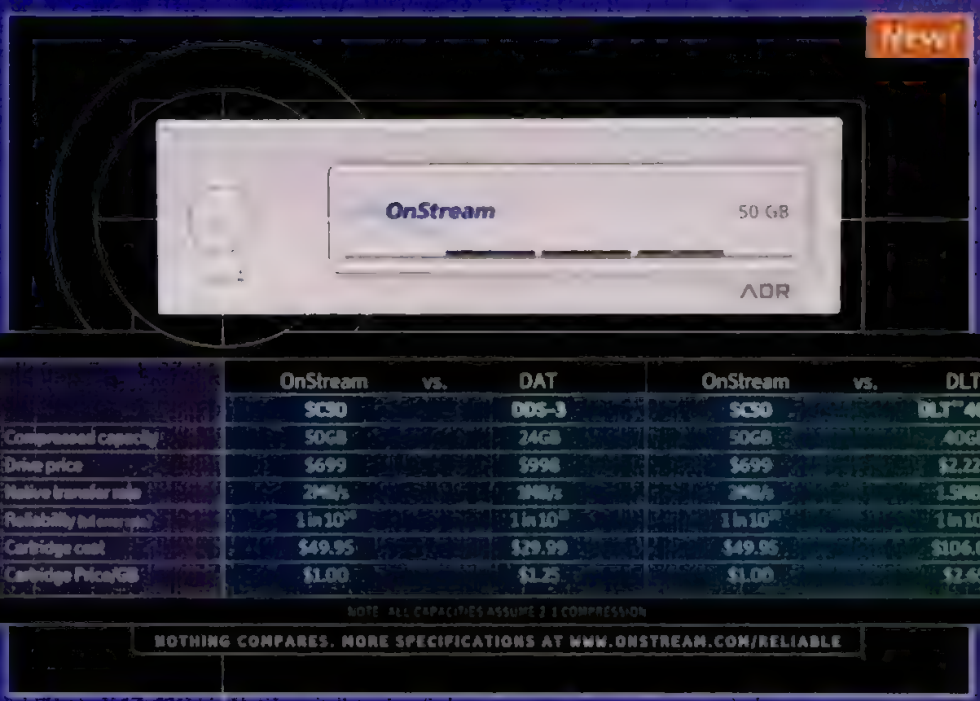

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Camera Accessories

Stitch, and Olympus Camera Utility software (the latter is an image browser that allows for preupload picture adjustments). If you rotate an image in the browser before transferring it to a hard disk, for example, you are given the option of changing or keeping the original filename; this lets you keep both the original and adjusted images.

The C-2000 has a shopping list of features and controls, including ISO settings, shutter speeds, aperture settings, and exposure compensation, all of which you can set to run automatically as well. It's equally powerful whether it's used with manual settings or in fully automatic mode. In low-resolution 640-by-480 mode, you can capture up to 45 shots continuously at half-second intervals; alternatively, you can get 30 1,024-by-768 images or 7 1,600-by-1,200 images.

When we tested the continuous-capture feature, we were pleased with the image quality, even in low-resolution mode. The test image for jury evaluation had excellent detail with realistic colors and a deep, three-dimensional appearance.

Replete with numerous power-user features, the Olympus C-2000 Zoom is bound to keep you happy.—*BB*

Panasonic PV-DC2590 PalmCam

1,280 x 960, CompactFlash. $800 street. Secaucus, NJ; 800-272-7033; www.panasonic.com.

● There's only one camera in our roundup equipped with a 56K modem CompactFlash card: the Panasonic PV-DC2590 PalmCam. This, plus a sharp 3X optical zoom lens and a second built-in CF slot, makes it invaluable for business users who transfer still or video images directly to a PC or operate the camera from a remote location.

The PalmCam is somewhat awkward to handle but refreshingly easy (though often slow) to operate. Buttons are readily identifiable, though a spartan control panel makes your shooting parameters difficult to understand. Because of the extra options, the PalmCam was one of the only cameras we preferred using in manual rather than automatic mode. The modem lets the PalmCam connect with a regular or cellular telephone and select and download images without a computer. The camera is specifically designed to interface with a 3Com PalmPilot. And users who don't need the modem can insert a second CF memory card.

The PalmCam's test photos were very sharp and clear—better than those produced by some cameras with higher resolutions. Illumination was even, but the camera's images were underexposed, and colors were unrealistically dark and

The CF modem, included with the Palm Cam, simplifies image downloads.

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What excites Michelle?

Michelle Pfeiffer gets a thrill from a child's first smile, first steps and first words. She also knows it's essential to interact with children by talking, singing, reading or simply hugging – especially during the crucial first three years, when their brains grow to 90% of their adult size. That's why Michelle supports "I Am Your Child," an initiative providing important child development information to parents and caregivers. Which is exactly what you'll find at firstyears.excite.com – a resource for those who are looking for critical facts and guidance on child development. What's more, when you personalize your Excite start page at www.excite.com, Excite will donate $2 to "I Am Your Child" – which should excite anyone who cares about kids.

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Photograph by Norman Jean Roy/Edge

You can expect a long battery life from Sanyo's newest digital camera.

muted. The print photo had accurate skin tones, but the Web image was even more underexposed, and all but the strongest colors looked washed out.

Despite its mediocre image quality, this is the camera to have if you need to send stills and video clips when you're away from the office.—*DG and SWG*

Sanyo VPC-Z400

1,280 x 960, SmartMedia. $700 street. Chatsworth, CA; 888-495-3452; www.sanyo.com.

● The Sanyo VPC-Z400 is meant primarily for businesses—including real estate and insurance agents and appraisers—and secondarily for consumers. But in general, it's a good choice for anyone who needs to take high-quality pictures with minimum work.

One nice touch the VPC-Z400 shares with some other cameras in this overview (such as the Agfa ePhoto CL50) is a panel that opens to use sunlight as an LCD backlight outdoors—although the LCD image still looks washed out in bright sunlight. The camera controls and icons are largely self-explanatory; we used the manual primarily to confirm that we had done everything right.

Image quality was good by any measure. Pictures ranged from acceptable to excellent at various distances and under a variety of lighting conditions. Our jury ranked the Web photo image in sixth place and the printed version in fifth, with one jury member choosing the printed version for first place. The only obvious artifact we saw on the print photo was a slight oversharpening of edges for dark objects against light backgrounds. The camera also did well on our Battery Life test, managing 309 shots with standard double-A batteries.

All told, the VPC Z400 strikes the right balance between ease of use, versatility, and image quality for its intended market. The only drawback to the camera is that it's a bit pricey, given that you can get equivalent cameras for less (notably the Agfa ePhoto CL50 and the Epson PhotoPC 750Z). But the Sanyo VPC-Z400 does make taking high-quality, point-and-shoot pictures very easy.—*MDS*

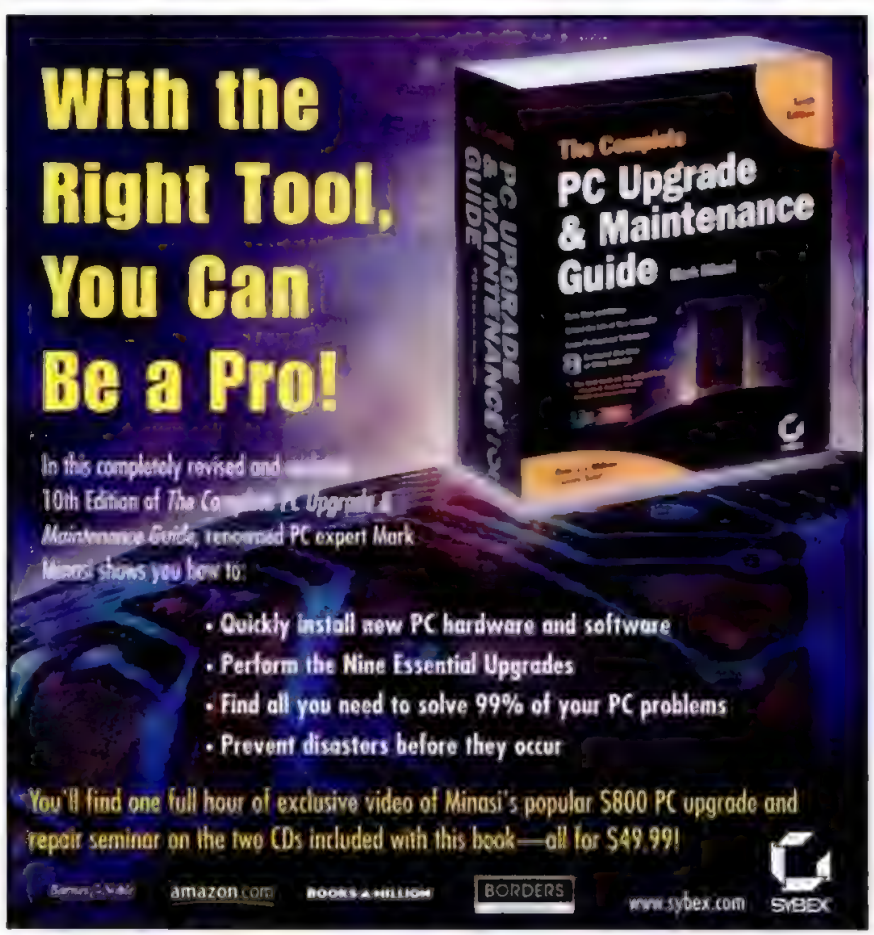
The handy Cyber-shot can also record MPEG-1 video and digital voice memos.

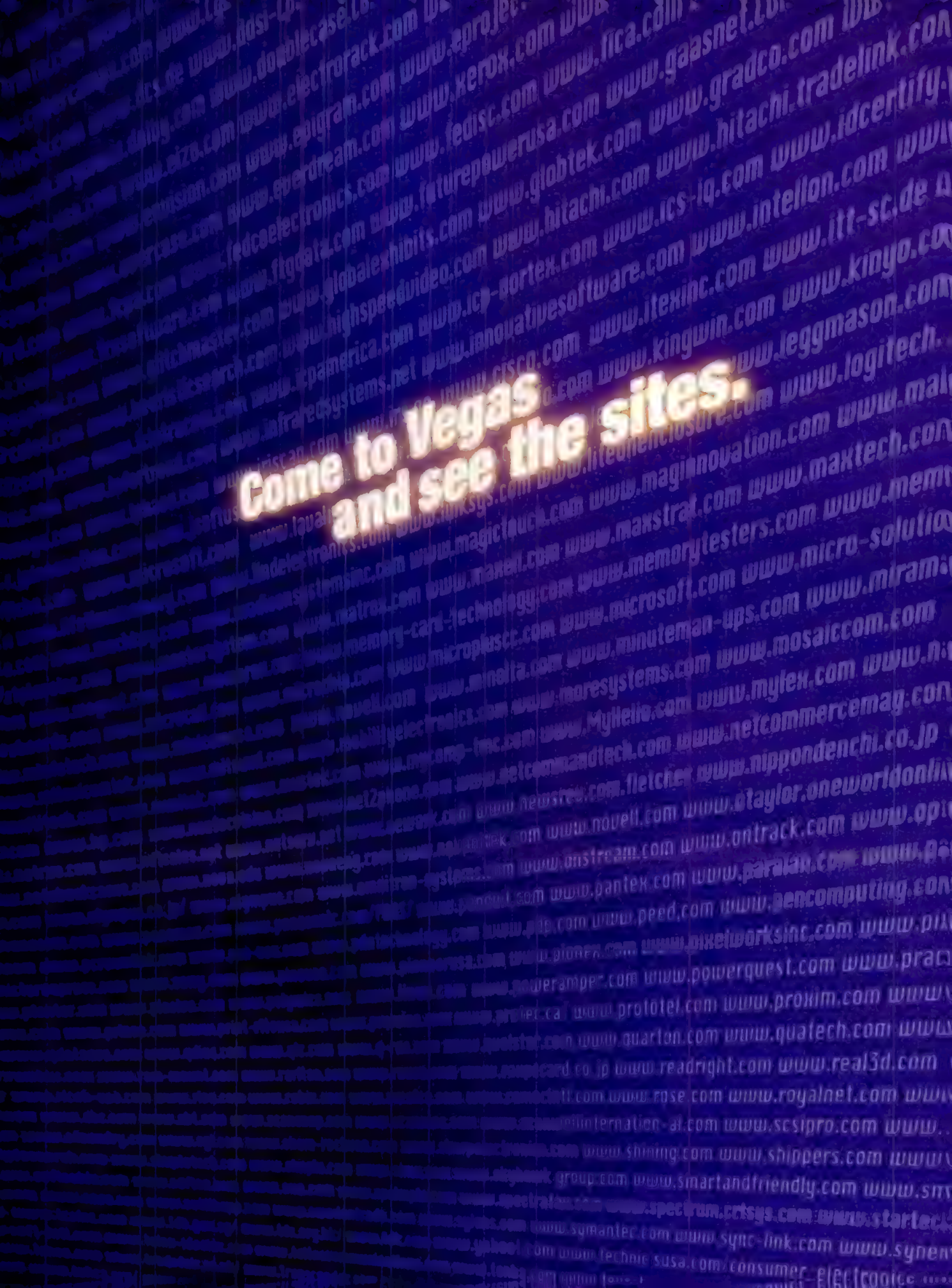
Sony Cyber-shot DSC-F55

1,600 x 1,200, Memory Stick. $800 street. Park Ridge, NJ; 800-222-7669; www.sel.sony.com.

●The best features of the Sony Cyber-shot DSC-F55 are its compact size (for a 2.1-megapixel camera) and its versatility: The unit can record audio and MPEG-1 video. Sony targets prosumers and avid amateur users with the Cyber-shot—which uses a Carl Zeiss lens—but the lack of an optical viewfinder and zoom, and the use of Sony's proprietary Memory Stick removable storage media, are drawbacks for demanding users. Image quality, however—a digital camera's core value—was judged very high for printed output and above average for Web publishing by our juries.

The Cyber-shot's 2-inch LCD has adjustable brightness levels and proved a pleasure to use in room light and daylight, but the missing optical viewfinder was irksome. Sony's intelligent lithium-ion battery technology displays remaining power in minutes, a more helpful method than the obscure fuel-gauge icons used by

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many other cameras. With the flash turned off, the battery life is rated for an hour of continuous shooting. On our tests, the Cyber-shot managed 126 full-resolution shots using the flash in automatic mode on a single charge.

One of the jury's favorites in the printed photo evaluation, the Cyber-shot produced extremely clear images with good detail and color fidelity, second only to the Kodak DC280. Although it lacks the features that professionals demand, the Cyber-shot is a fine camera for family and general business use.—*BB*

Toshiba PDR-M4

1,600 x 1,200, SmartMedia. $800 street. Irvine, CA; 800-550-8674; www.toshiba.com.

● If cameras were rated on looks alone, the Toshiba PDR-M4's stunning Art Deco look would win hands down. But looks aren't everything, and despite its excellent design, fast shooting time, and affordable price, family and SOHO users will be disappointed by its relatively poor image quality.

The PDR-M4 is a small, silver instrument with a motorized protective flap over the lens that opens when you turn on the camera. Boot-up takes only 2 seconds, and a large buffer means that each image can be captured, processed, and saved in less than a second. The controls are well placed and logically identified: Even novices will be able to operate the camera easily in automatic or manual modes. The high-resolution LCD is bright and detailed but comes at a cost: The PDR-M4 came in dead last on our Battery Life test. Shooting, however, is instinctive, fast, and fun.

Because of inadequate flash illumination, our print photo test image was underexposed by more than two f-stops, making everything seem dark and dull. Highlights were clipped severely, with little detail in shadowy areas. Colors were muted and muddy, and skin tones were reddish and unrealistic. Image detail was adequate but disappointing for a 2-megapixel CCD. The Web photo looked even worse, exhibiting a foglike pallor.

The PDR-M4 is a great camera for snapshots, especially outdoors, and it certainly looks snazzy. But although it's a 2-megapixel camera, don't expect great-looking images.—*DG and SWG* PC

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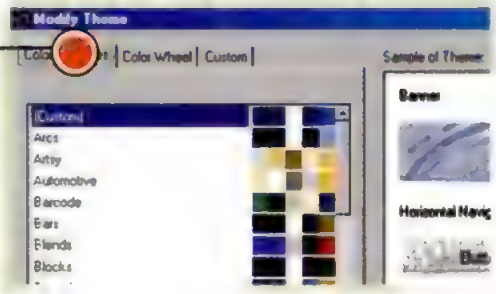
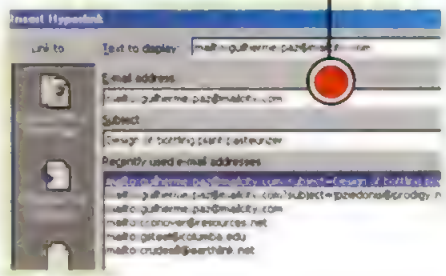
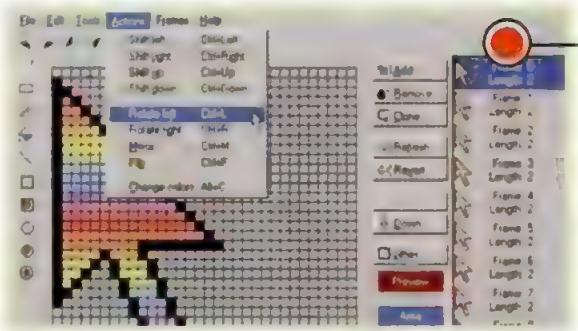


Modify FrontPage's Themes to give your Web site a unique look. *Page 194*



Link to e-mail addresses from your Access database. *Page 199*

Protect your system with a separate drive for backups and testing. *Page 209*



Jazz up your pointing and clicking by designing your own mouse pointers in CursorDance. *Page 221*

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CursorDance lets you create animated mouse pointers to personalize your Windows desktop.

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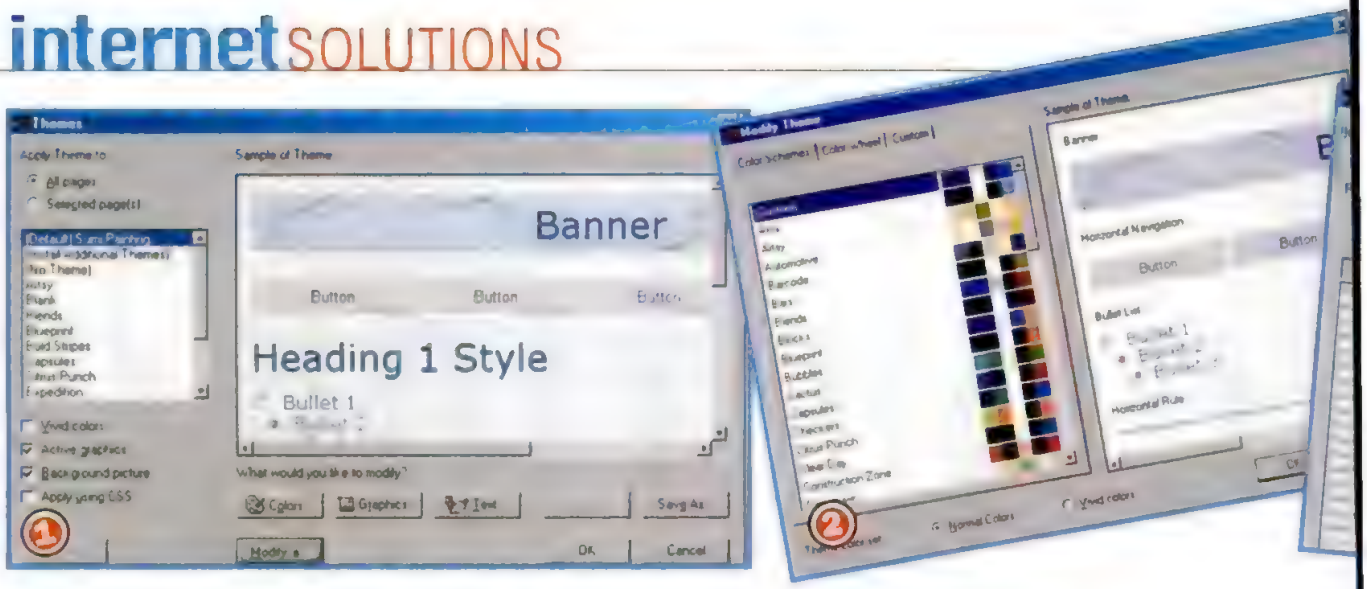


1. FrontPage's *Themes* dialog box is where you choose a consistent style for your Web site. The box displays a sample of how pages in the Theme will appear, and it offers simple customization through check boxes. More advanced choices are accessible from the *Modify* buttons.

2. When you click the *Themes* dialog's *Colors* button, you're presented with this dialog box. It offers three ways to change colors: Using a color scheme from any preset Theme, choosing from a color wheel, and specifying a custom color for each element on the page.

3. The *Graphics* button leads to this dialog box, in which you can choose the image files to use for elements like page backgrounds and banners. You can also designate the font that will be used for any text appearing in your graphical elements.

Edit Microsoft FrontPage Themes

Adjust FrontPage 98 and 2000's Themes to create a unique look for your Web site. *By Neil Randall*

FrontPage Themes are designed to help you build a Web site with a consistent graphical look. Available in the 98 and 2000 versions of the Web publishing software, Themes give each page of your site the same background image or color, the same typeface, size, and color for each level of text in the document, and an array of other graphical consistencies. FrontPage 2000 ships with over 60 Themes; you can use these as shipped, edit them for your specific purposes, or create entirely new ones.

To get started, you need to open a *web*—FrontPage's term for a Web site you're designing in the program—then select *Theme* from FrontPage's *Format* menu. The large *Themes* dialog appears (Figure 1) with the current Theme displayed in the *Sample of Theme* window. This Theme applies to your entire web. You can edit the Theme from any of the FrontPage views, but only in *Page* view do you have the option of applying a Theme to an individual Web page or to a set of selected pages. With the other views, the Theme you select is applied to all the pages in the web. Editing features are in two locations: directly below the Theme names on the left side of the *Themes* dialog, and hidden behind the *Modify* button below the *Sample of Theme* window.

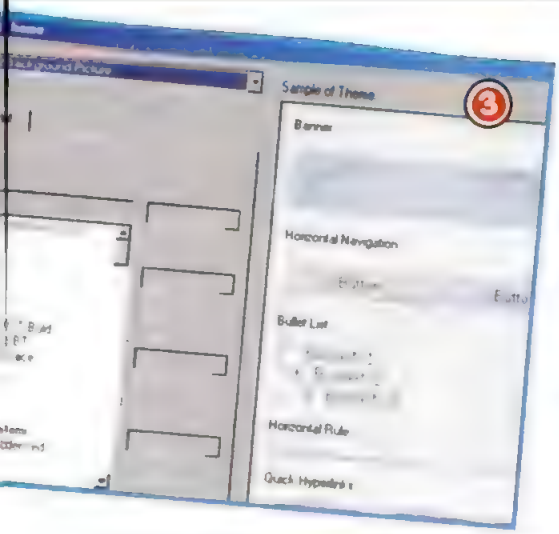
THE CHECK BOX OPTIONS

Four options are available in the check boxes below the Theme names. Here you can set the Theme to use a background picture or a solid background color, and you can specify that the Theme use vivid colors or standard colors. Another option is to have the Theme use active graphics or standard graphics. Active graphics include animated elements such as hover buttons, banners, and bullets. In an animated hover button, for example, the button changes when the user rests the mouse pointer on the graphic. (In FrontPage, you can define how the button changes—having it light up or appear pressed, for example.) Active graphics may also be simple animations.

A fourth check box offers the option to apply the Theme using the Cascading Style Sheets standard (see "Taking Style Sheets to the Next Level" in our December 1, 1998, issue). The benefit of using CSS is that it's a standard, so your resulting HTML code is more fully compatible with current browsers. The drawbacks are that older browsers won't recognize it, and that CSS is not a particularly easy code to work with. But because active graphics are also often incompatible with older browsers, and because CSS is the growing trend in both HTML and XML designs, it's a good idea to use this feature whenever possible. Note, however, that CSS won't display properly unless your server is running the Windows 2000 FrontPage server extensions.

THE THEMES DIALOG

The check box options are fine, but they don't really edit a Theme, they simply apply features that are already part of the Theme but not currently selected. To edit the Theme itself, use the *Format | Theme* command to open the *Themes* dialog. Select the Theme you wish to edit, then click the *Modify* button. Three new buttons appear: *Colors*, *Graphics*, and *Text*. Each of these features



includes multiple editing options. All three call up a dialog called *Modify Theme*, but the actual dialog for each option is different.

As you alter Themes, you can save the changes. Be careful not to overwrite the existing Theme! Instead, the first thing to do is click the *Save As* button (on the initial *Themes* dialog) and give your Theme a new name. Then, as you modify, you can return to the Themes dialog and click the *Save* button again to preserve your changes without getting rid of the original.

From the *Colors* dialog box (Figure 2), you can modify the color scheme of your Theme in three different ways. The first two tabs let you change all the colors of a Theme at once, but retain its graphical and font design. The *Color Schemes* tab lets you select the colors featured in any other FrontPage Theme, and the *Color Wheel* tab lets you choose a color scheme (again for the entire Theme) by sliding a pointer around a wheel of colors. Clicking the *Custom* tab lets you assign different colors to each Theme element: hyperlinks, headings, banner text, table borders, and others.

The *Graphics* dialog (Figure 3) lets you change the graphics on your site, as well as the type, size, and alignment of the fonts used with each graphic element. Under the *Picture* tab is a drop-down list of graphic elements, such as background pictures, banners, and navigation buttons. Selecting one of these will show you the graphic file used by the Theme for that element, and with the *Browse* button, you can replace this file with one of your own choosing. The *Font* tab gives you another drop-down list, this time of graphic elements that contain text. Select one, then from the *Font* menu below select the font you want to use in place of the default one. You can also adjust the font's style (italic, bold, and so on), its size, and how it should be aligned vertically and horizontally on the graphic.

Clicking the *Text* button on the *Themes* dialog opens a dialog with a drop-down list of the HTML text items—the body and the six heading levels and a font listing that lets you specify the font for each level of text. The list covers every font installed on your machine, and you can use them freely. Keep in mind, though, that not all browsers can display these fonts, so you should use FrontPage's *Preview in Browser* feature (under the *File* menu) to see what your font actually looks like in each of your installed browsers. In fact, the *Preview in Browser* feature is immensely useful for all of your FrontPage work because it eliminates the surprise, which often comes after extensive Web design work, of seeing what your users will see once your site is live.

Editing Themes is quite easy and enjoyable. But always keep in mind that your site exists for the sake of satisfying its visitors, not for the sake of satisfying your urge to experiment. Still, there's no saying that Microsoft's Themes, or those available from third-party vendors (see the table), are perfect for what you believe your visitors will want. Since you need the perfect look, experimenting with the Themes dialog makes a lot of sense. The other reason to modify the Themes that ship with the product, of course, is that these Themes are available to all FrontPage owners. Even a good Theme loses its effect if it's out there on too many sites. PC

Neil Randall is coauthor of Special Edition Using Microsoft FrontPage 98 *(Que) and a contributing editor of* PC Magazine.

Where to Get Additional FrontPage Themes

As you might expect, there are alternatives to editing existing Themes or designing your own. Several third-party vendors offer Themes for purchase. Most of these sites offer some free Themes as well to get you started.

	URL	Price
Alysta FrontPage Themes	*www.alysta.com/fpthemes/themes.htm*	$7.95 each
Auscomp	*www.auscomp.com*	$9.95 per series (5–10 Themes)
Captivations	*http://captivations.com/theme/frontpage.htm*	Set of 10, $14.99
DPA Software	*www.dpasoftware.com*	FrontLook (includes 33 Themes), $29.95
EB Theme Shop	*www.ebthemeshop.com*	$5.95–$7.59 each; package of 100, $99
PixelMill	*www.pixelmill.net*	$7.99–$9.99 each
Theme-Pak	*www.themepak.com*	$5.95 each; package of 100, $99.95
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WebSpice.com	*www.webspice.com*	WebSpice Themes 2000 (2000 Themes), $99.95

Sorting Favorites in IE5

Microsoft Internet Explorer 5's *Favorites* menu isn't sorted automatically. New items just get added at the end. This can be a problem when you have many Favorites, and you can't always remember where you put them. All you need to do is bring up the *Favorites* menu, right-click anywhere on it, and choose *Sort by name* from the resulting pop-up menu.

In many cases, a page added to your Favorites will have an overly long name like "Welcome to booksamillion.com." Sorting the Favorites is more effective if you first rename them something shorter.

John Sheehan
Oakdale, Minnesota

With IE5 installed, you can reorder the *Favorites* menu items by dragging. That's why they aren't sorted automatically. The handy right-click *Sort by name* feature also works on the *Programs* menu and its submenus.—*Neil J. Rubenking*

Saving a Web Page

When I save a Web page in Microsoft Internet Explorer and then open it during a subsequent session, the browser still seems to head out onto the Web to download components. This is a problem sometimes when IE can't reach the server. How can I download everything on the page?

Jason Lee
via the Internet

There are two ways to do this in IE5. With the page viewable in the browser window, select *Favorites | Add to Favorites*. In the *Add to Favorites* dialog, click the check box labeled *Make available offline*. Give your page a name you will remember, and then click *OK*. You can then go into your Favorites list, open that page, and you'll get all the page elements, even if you're not connected to the Internet. You can accomplish the same goal by bringing the page into the browser window, selecting *File | Save As*, and selecting *Web Page, complete (*.htm, *.html)* in the *Save as type* field. Sometimes a Web page will be too complex to save in these ways, but for the vast majority these methods work fine.—*NR*

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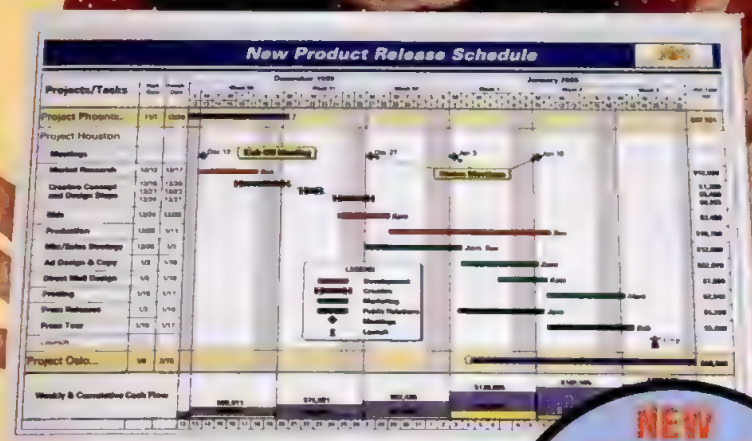

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One-Click E-Mail in Access

Hyperlinks in Microsoft Access needn't be restricted to Web pages. Here's how to create an e-mail link. *By Sal Ricciardi*

Starting with Access 97, Microsoft has provided hyperlink support for one-click access to the Internet. But at first glance, it's not obvious that hyperlinks can be used to jump to more than just Web pages. Indeed, hyperlinks are not limited to addresses that begin with *http*, the often-taken-for-granted prefix to a fully specified Web page address.

The abbreviation *http* stands for HyperText Transfer Protocol; its appearance in a URL tells the browser that you want to transfer to and display a Web page. But you can specify other protocols by listing a different protocol abbreviation. To use your e-mail client, you specify `mailto:`. This tells the browser to invoke your e-mail client and start a new message using the specified e-mail address as the recipient. Each protocol has its own format. The format for mailto is *mailto:e-mail-address*.

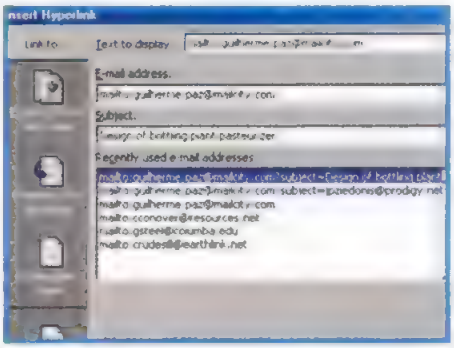


FIGURE 1: *You can place one-click e-mail addresses in your Access applications and edit them in this dialog box.*

There are two ways to incorporate mailto-style hyperlinks in your Access applications. First, you can use field-based hyperlinks to store e-mail addresses in your table. This has the advantage of offering single-click e-mail access to users browsing the database outside of your forms (say, in datasheet view) because the hyperlink is table-based. The second way is to employ Access's support for control-based hyperlinks. You can embed hyperlinks in the properties of unbound labels, command buttons, or image controls starting with Access 97.

All hyperlinks consist of three parts: display text, hyperlink address, and hyperlink subaddress. Only the first two are relevant when you're using mailto. The display text is the text the user will click on to start his or her e-mail client. Usually the text is a name or an e-mail address. The hyperlink address holds the fully specified address, in our case, a mailto address like *mailto:Tom_Smith@datanet.com*. The hyperlink subaddress is used for navigating to a particular location within a document but is not currently used with mailto addresses.

Hyperlinks stored in a table must be in the following format:

```
Display Text#Hyperlink Address#Hyperlink SubAddress
```

For example, to display Solomon Smudley as a clickable e-mail address, you'd use something like this:

```
Solomon Smudley#mailto:Solomon_Smudley@domain.com#
```

Once you have the hyperlinks correctly stored, all you need to do is drag the hyperlink field from the Field List to a form and set its IsHyperlink property to *True*. Thereafter, a single click on that field launches the e-mail client. To edit a clickable hyperlink, right-click on the hyperlink, select the *Hyperlink* menu, and choose *Edit Hyperlink*. This displays the *Edit Hyperlink* dialog shown in Figure 1.

If you're using control-based hyperlinks, you set the control's Caption, HyperlinkAddress, and HyperlinkSubAddress properties either manually or through VBA code. Access uses the control's Caption for the hyperlink's display text when the control is a command button or a label. If you're using an image control, there is no caption and thus no display text, so you must convey your message through a well-chosen image, such as an envelope. When using these unbound controls, you'll want to be careful to update their properties to reflect navigating from one record to another, such as by placing code in the Form's OnCurrent event to update the HyperlinkAddress property.

FURTHER READING

For more information on hyperlinks and their use in Microsoft Access, see Chapter 23 in the *Microsoft Access 97 Developer's Handbook*, by Paul Litwin, Ken Getz, and Mike Gilbert (published by Sybex), and Chapter 15 in the *Microsoft Office 97/Visual Basic Programmer's Guide*, published by Microsoft Press. PC

Sal Ricciardi is a contributing editor of PC Magazine.

USER TO USER

PC MAGAZINE'S COMMUNITY OF EXPERTS AND READERS

Splitting a Month's Dates

I'm developing a bimonthly time-card application in Excel. In cells A9 through A24, I need to have the numbers 1 through 15 (with a blank in A24) or 16 through 31, depending on whether the current date is in the first half or second half of the month. The current date is recorded in J3. How can I avoid entering the numbers manually each time I create a new timecard?

Greg Militano,
via the Internet

You can do this pretty easily with a set of IF functions. In A9, write

```
=IF(J3<16,1,16)
```

at A10, put

```
=IF(J3<16,2,17)
```

and so on. You probably don't want a 31 in A24 on months that don't have 31 days. Alter A24's formula as follows:

```
=IF(DAY(EOMONTH(J3,0))=30,""
,IF(J3<16,15,31))
```

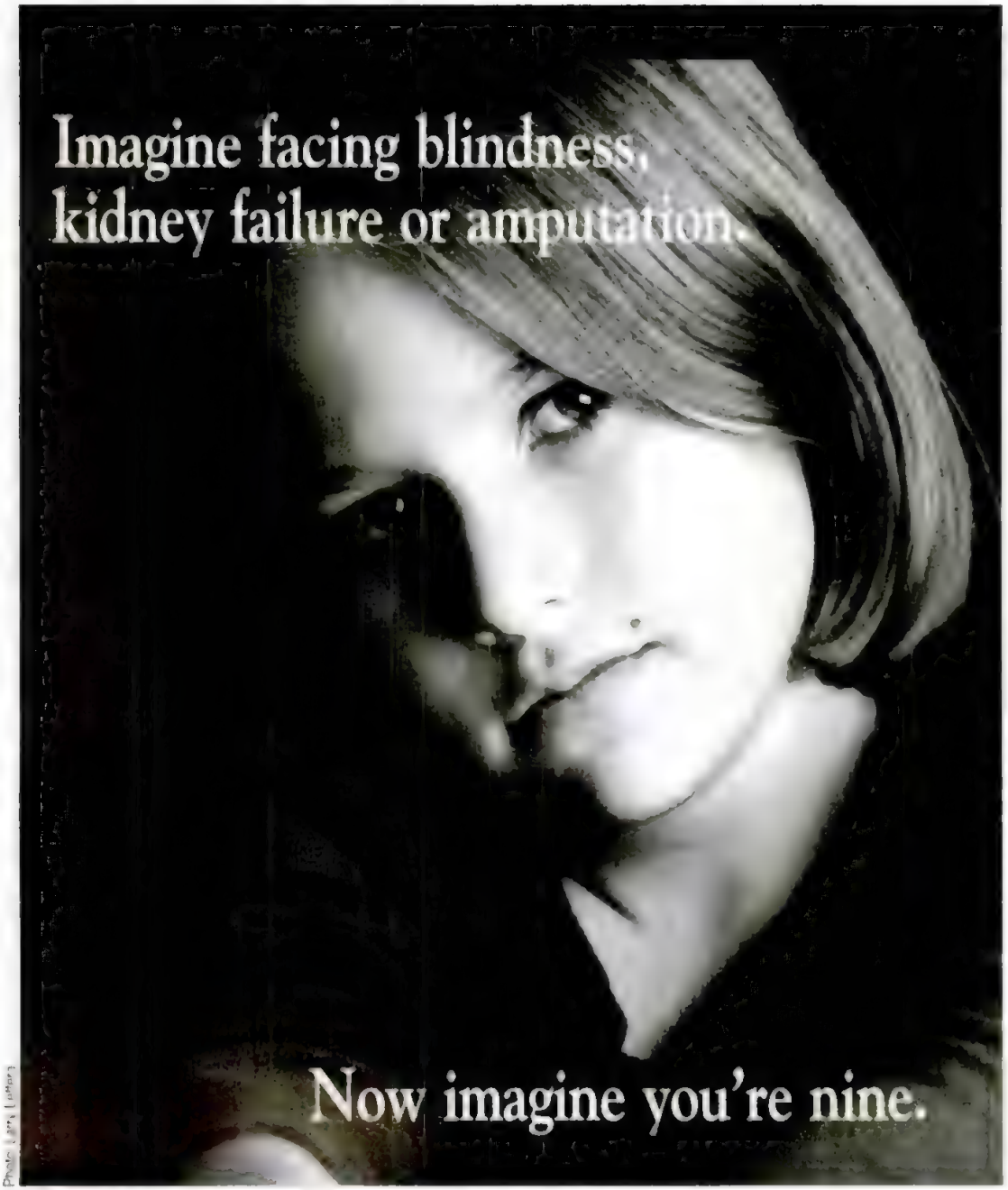
will solve that problem.—*Craig Stinson*

Print Directories Using Outlook

PC Magazine's Solutions column in the Issue of August 1999 contained an item titled "Print Directory Lists" (online at *http://cgi.zdnet.com/slink?6993*). Printing directory lists under Windows is easy if you have Microsoft Outlook. In Outlook, select the *Other Shortcuts* section of the Outlook Bar and click *My Computer*. Outlook displays your disks, folders, and files in a manner that's very similar to Microsoft Windows Explorer. You can choose *File | Print* to print what's displayed.

Gordon Padwick
via the Internet

You'll get the best results with an Outlook view formatted especially for printing. Click *View | Define Views* and make a copy of the Details view. Call it *Printable*, and make it available for all folders. In the *View Summary* dialog, click *Fields* to select and order the fields you want printed. Then click *OK* and *Apply View*. Select *Format Columns* from the *View* menu to fine-tune the formatting, for example, choosing the formats for file dates and times. To customize fonts, headers and footers for printing, choose *File | Page Setup | Define Print Styles*. Now just select the Printable view before printing a list of files.—*Neil J. Rubenking*



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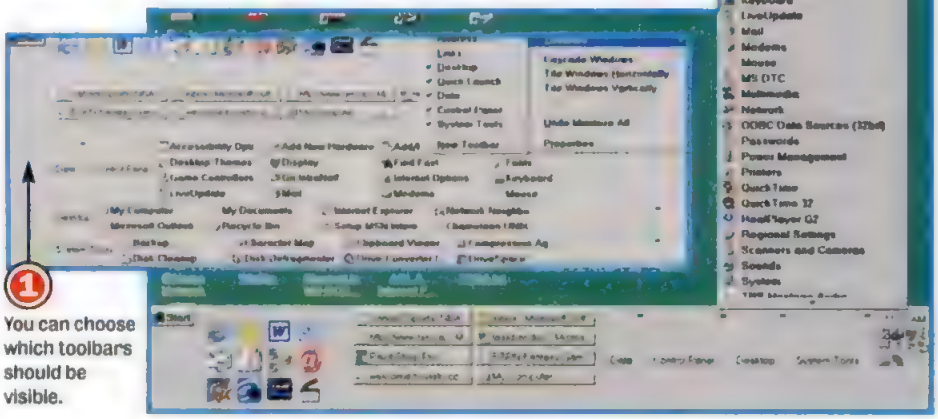
Customizing the Taskbar

Easier access to files and folders—plus faster task switching—is just a few clicks and drags away! *By Neil Randall*

The Windows taskbar sits quietly at the bottom of your screen, giving little indication that it's anything more than an anchor for your open applications. But the taskbar has become a major interface component—one you can customize in a number of highly useful ways.

Some of the taskbar's functionality was available as early as the original Microsoft Windows 95 and Windows NT 4.0. Then, as now, you could drag any icon to the *Start* button to have the icon appear when you clicked *Start*. In addition, by right-clicking on the taskbar and selecting *Properties*, you could set the taskbar to *Auto hide*, that is, to disappear until you slid the cursor to the bottom of the screen. And of course, most install programs placed icons on the *Start* menu. But the only way you could add anything to the taskbar itself was by launching a program, in which case that program's title-bar information (usually the application and filename) appeared as a button on the taskbar. None of these useful things have changed, but if you've installed Microsoft Internet Explorer 5 or if you're using Windows 98, you can do a lot more to customize the taskbar.



THE DEFAULT TOOLBARS

Right-click on the taskbar and look at the *Toolbars* menu item. You'll see at least the four default items: *Address*, *Links*, *Quick Launch*, and *Desktop*. One or more may have a check mark beside it, which has the effect of making it visible on the taskbar. The *Links* and *Address* toolbars demonstrate Windows integration with the Internet. These toolbars duplicate those in the top portion of your IE browser, and you can use them exactly as you would on IE. Right-click on the taskbar and select *Toolbars* to toggle them on.

By default, the *Quick Launch* toolbar is toggled on. Typically, *Quick Launch* is the one directly to the right of the *Start* button, and on installation, it contains three icons: IE, Outlook Express, and Show Desktop. You can add any icon you want to the *Quick Launch* toolbar by dragging it from a folder or the desktop. You can also drag icons directly from the *Start* menu and the Programs folders. Click *Start*, then *Programs*, find the icon for the application you want and drag it to the *Quick Launch* toolbar. Presto—you can now launch that application directly from the taskbar. Figure 1 shows the *Toolbars* menu with check marks beside the toolbars visible on the taskbar.

On installation, Windows places a Show Desktop icon on the *Quick Launch* toolbar. Clicking on this icon minimizes all open windows and lets you see your desktop; clicking it again restores the windows to their previous positions. A more useful way to access these items, however, is available through the Desktop toolbar. When you toggle it on, this toolbar appears on the taskbar and displays all the icons on your desktop.

USER TO USER

PC MAGAZINE'S COMMUNITY OF EXPERTS AND READERS

Formatting Floppy Disks in Windows NT

When I tried to format floppy disks using Windows NT Explorer, I'd often get a message stating: "Windows NT cannot format this drive. Quit any disk utilities or other programs that are using this drive, and make sure that no window is displaying the contents of the drive. Then try formatting again." I would then close Explorer, launch My Computer, right-click the drive, and disks would format fine.

It turns out that in order to format a floppy disk through Explorer you need to highlight My Computer in the left panel and right-click on the 3½ Floppy icon in the right panel. I was always right-clicking on the 3½ Floppy icon in the left panel, but since the right panel would then display the floppy disk's contents, Windows couldn't format it.

Richard Speiss
Winnipeg, MB, Canada.

This happens in Windows NT, but not in Windows 9x. By observation, you don't actually have to select *My Computer*. As long as the right-hand Explorer pane isn't displaying the floppy disk's contents, you should be able to click the icon and format a disk in the drive.—*Neil J. Rubenking*

Use Find to Verify Any Disk

These days I use a CD burner for backup, and I really need a reliable way to verify copied files. You can use ScanDisk to verify a floppy disk, but it won't work with a CD-R. I came up with a solution using the Find utility. Launch Find from the *Start* menu, select the drive, and check *Include subfolders* in the *Containing* text-box field, enter some bogus text that's definitely not found on the disk, such as *rubber baby buggy bumpers*. When you click *Find Now*, Find will search every file on the disk in a vain attempt to find that text. It searches all files, not just text files. If any file is unreadable, you'll get an error message letting you know of the problem.

Ethan Winer
New Milford, Connecticut

Most backup disks will probably pass this test. If a problem does occur, you'll get an error dialog for each defective file. Rather than wade through these messages, your best bet is to stop the Find operation and create a new backup disk.—*NJR*

Can't Compress FAT32 Drives

I received an error message when I tried to compress my hard disk. The reason given was that it is a *FAT32* drive. What does this mean, and why can't I compress it?

Kris Tina
Bourbon, Indiana

The FAT (file allocation table) file system is a veritable antique, going back to early versions of DOS. Under this file system, the larger the drive, the more space is wasted for each file. The FAT file system can't be used on a partition larger than 2GB. FAT32, a 32-bit enhancement to the FAT file system, supports disks larger than any that exist at present. The average wasted space per file is much smaller than under FAT and doesn't increase for larger disks.

Disk-compression technology was invented to get more data and less wasted space on FAT16 drives. The benefits of disk compression would be substantially less on a FAT32 drive, which is probably why the technology has not been ported to FAT32.—*NJR*

Fix Your *Programs* Menu

Many readers have written to us about their overloaded *Programs* menus. An impossibly large *Programs* menu can take two forms. If you're running Microsoft Windows 98, or if you installed the Windows Desktop Update with Internet Explorer 4, it will be a single scrollable column. If not, it will expand to multiple columns. Some readers want the multicolumn menu back, but the single-column menu is an integral part of the WDU. The real problem comes from having too many items. The single-column menu scrolls painfully slowly, and the multicolumn menu can cover the whole screen.

The practical solution is to reorganize the *Programs* menu by adding submenus. To begin, right-click the *Start* button and choose *Explore*, and then open the Programs folder. Every shortcut here is an item on the *Programs* menu, and every subfolder is a submenu. Find a group of similar items, create a subfolder for them, and drag them into it. For example, create a folder named *Utilities* and move all utility programs into it. Keep grouping and organizing until your *Programs* menu reaches a reasonable size.—NJR

Obviously, you don't want every icon on your desktop displayed on the taskbar at all times, so Windows lets you resize the toolbar. Click on the raised edge on the toolbar's left border and drag it to whatever position you like. As you drag it, you will hide its associated icons, but they will still be available by clicking on the small menu arrows (>>) on the toolbar's right side. Doing so yields a full menu of all desktop items, including cascading menus for desktop folders. Figure 2 shows the effect of clicking the menu arrows on the Control Panel toolbar.

ADDING NEW TOOLBARS

Of course, you're not restricted to the default toolbars. You can add your own to reflect the way you work, and this is the taskbar's real strength. Any folder can be turned into a toolbar by simply dragging it to the taskbar. If you have a separate folder in which you keep the data files that you access constantly, drag it to the taskbar and access its files and folders from there. If you want instant access to the Control Panel, open My Computer and drag the Control Panel icon to the taskbar. The same holds true for Dial-Up Networking, which is also accessible from My Computer. To access other program folders, right-click on the *Start* button and choose *Open*, then open the *Programs* folder from the *Start Menu* window. This is a very good way, for example, to make all of Windows 98's systems tools available without going through the hassle of clicking *Start* | *Programs* | *Accessories* | *System Tools*.

The rule, to summarize, is this: When you drag a folder to the taskbar, that folder becomes a toolbar. When you drag a folder or a file to a toolbar, the folder or file becomes an icon (that is, a shortcut to that folder or file is added) on that toolbar. If you try to drag a file to the taskbar, however, you get the *no-drop* cursor, indicating that you can't drop that file on the taskbar. You can get rid of a toolbar you've added by right-clicking it and selecting *Close* or by right-clicking anywhere on the taskbar, selecting *Toolbars*, and toggling the specific toolbar off.

ARRANGING THE TASKBAR

To make the taskbar really useful, you'll want to arrange the various toolbars to your liking. Note that you can resize the taskbar itself by dragging its upper edge either up or down on the screen. The default size is one row, but you can increase the number of rows until the taskbar occupies half the screen (the actual number of rows changes according to the screen resolution you're using). By increasing the number of rows, you increase your options for taskbar arrangement.

The trick is to drag each toolbar either up or down on the taskbar (by clicking and dragging the raised edge at its left border) until it's on a row you like. Once you place a toolbar on a row, you can resize it by dragging its raised edge left or right. As you resize one toolbar, you'll also resize the toolbar you slide against. Note that you can reduce the space a toolbar needs by turning off the toolbar titles, the icon titles, or both (right-click on the toolbar and uncheck *Show Title* and *Show Text*, respectively). If you need more room to arrange the toolbars, resize the taskbar itself.

Take a look again at Figure 1. As you can see, you can arrange your toolbars row by row, resulting in a large taskbar with easy access to the toolbar's associated icons. By comparison, Figure 2 shows the toolbars arranged side by side on a smaller taskbar, with the icons for each toolbar accessible through the menu arrows.

No matter how you use your taskbar, the point is to make it an easily accessible interface to your most important computer activities. Because the taskbar is always quickly accessible, it's a stronger interface component than the desktop itself and offers a more focused computer experience than the *Start* button, whose menus can quickly become too cluttered for effective use.

CRIB SHEET

TASKBAR TIPS

You can't delete the default toolbars from the *Toolbars* section of the taskbar's right-click pop-up menu.

When you close a nondefault toolbar, it no longer appears in the *Toolbars* section of the taskbar's right-click menu. To get it back, you must drag the folder onto the taskbar again.

Arranging multiple toolbars takes a bit of patience and trial and error; practice by dragging the toolbars to various positions.

Instead of dragging folders, you can add a toolbar by choosing *New Toolbar* from the *Toolbars* section of the taskbar's right-click menu, then browsing for the desired folder.

Don't forget the taskbar *Auto hide* feature in the *Taskbar Properties* menu if your taskbar is taking up too much room.

Typing a URL into the Address toolbar will launch your default browser. If it's already launched, the primary browser window will connect to the site.

Typing the full pathname of a program or document into the *Address* toolbar will launch that program or document.

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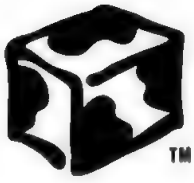

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- Integrated Intel 10/100 Twisted Pair Ethernet
- 17X min/40X max CD-ROM Drive
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- Year 2000 Compliant[4]

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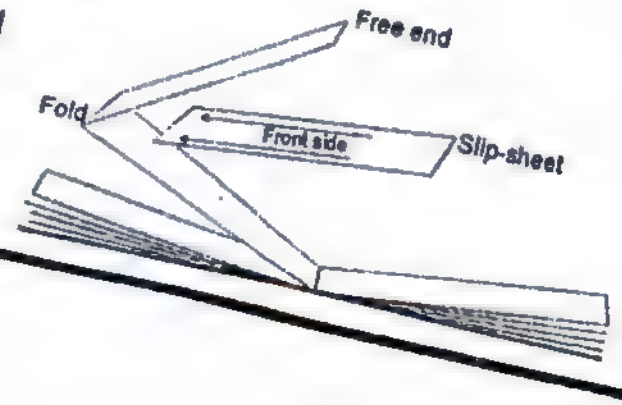

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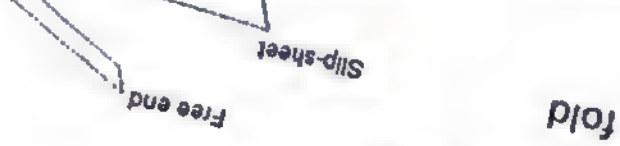

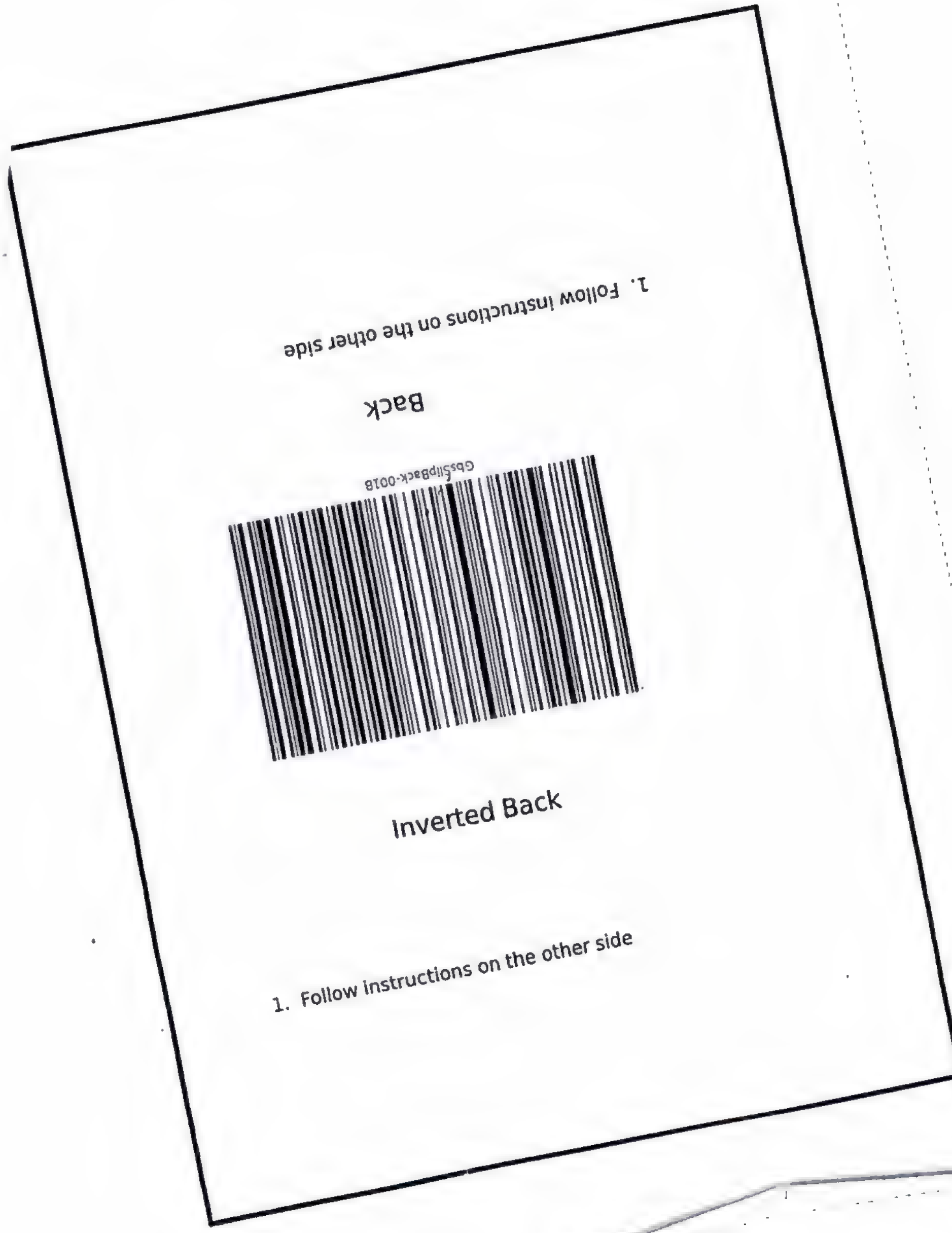

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Mixing IDE and SCSI Hard Disks

You might assume that a system with two disks should use the same interface. Here's why you could be wrong. *By M. David Stone*

If you're putting two hard disks in a single system, the automatic assumption is that you'll get two drives with the same interface, using either SCSI or IDE for both. While this makes sense in many cases, there are some advantages to mixing interfaces.

Having both SCSI and IDE on one system can make good sense if you're using one drive to back up the other, or if you need to use a single machine as your working machine and as a testbed—perhaps for use with beta software. In either case, mixing drive interfaces is a powerful way to get more out of a system.

COMPARING SCSI WITH IDE

It may help to start with a quick comparison of SCSI and IDE. Both kinds of drives install in much the same way: For an internal drive, you have to mount the drive in a bay, connect the power and data cables, then set a jumper on the drive. Even so, there are some important differences.

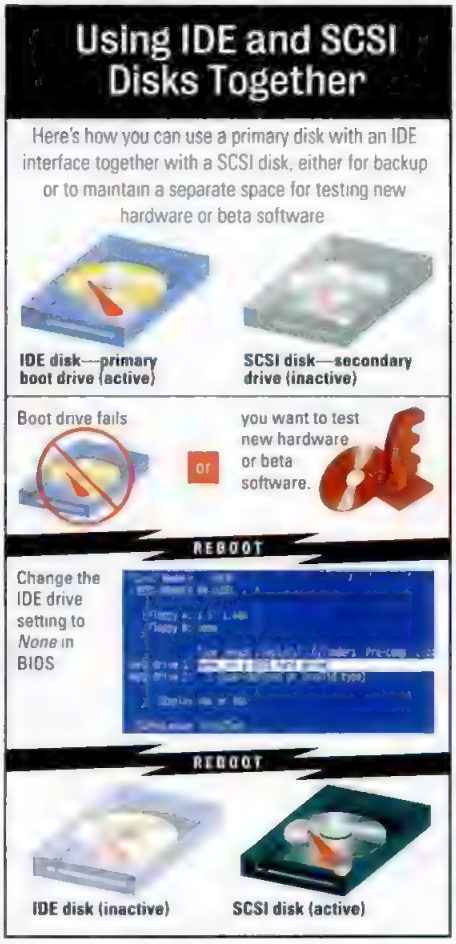
Just about every PC includes support for IDE drives, typically with connectors on the motherboard. When installing a SCSI drive, you may have to install a SCSI board first, if you don't already have one in your system. Unless you have a truly ancient system that predates plug-and-play, however, this involves little more than plugging a SCSI board into a slot. Note that SCSI devices are connected in a chain arrangement, and need something called a *terminator* on each end of the chain. Many SCSI devices today are self-terminating, however, which means they handle the need for termination automatically, so this is often a nonissue.

Setting drive jumpers is easier for SCSI drives than for IDE drives. With SCSI drives, you only need to make sure that each drive has a different SCSI ID, with the boot drive at the lowest ID number available. IDE drives have three possible settings—*master*, *slave*, and *single drive*—but not all IDE drives offer all three settings. In general, if you have two drives on the same data cable, the boot drive should be set to master and the second drive to slave. If you have only one drive, it may be set to either master or single drive, depending on the particular drive model.

The conventional wisdom is that SCSI is the hard-disk interface of choice for network servers and power users, and IDE is the interface of choice for everyone else. There's some truth behind that premise, but there are also exceptions. In fact, IDE is often as good a choice as—or even better than—SCSI for power users, even if they are not thinking of mixing the two.

A persistent myth about hard disks is that SCSI drives are inherently faster than IDE drives. This simply isn't true. Historically, the SCSI interface at any given time has always allowed a faster burst rate than the IDE interface, but the burst rate indicates only how fast data can travel over the interface. The limiting factor in most circumstances is the internal transfer rate—a measure of how fast data can move between the drive head and the disk platter.

As long as the burst rate of the interface is greater than the internal transfer rate, any



USER TO USER

PC MAGAZINE'S COMMUNITY OF EXPERTS AND READERS

Quick Document Capture

Here's a tip for those who want to make quick copies of documents away from home or office: Use your digital camera to capture the pages!

Ed Carson
Medina, New York

Portable scanners are effective tools for capturing document images in the field, particularly when you want to convert the image file to a word processing format via OCR software. Sometimes, however, when you don't need to work with the text later and don't want to take the time to scan in pages, it's much easier to use a digital camera to capture document pages. For best results, start by setting your camera's image resolution and contrast to the highest levels and, if available, set the camera to monochrome mode. Because megapixel-resolution cameras create huge files that use lots of storage space, practice with your camera to find the lowest resolution setting that can capture readable text, especially if you are capturing many pages. Toshiba's PDR-M3 Digital Still Camera ($599 street, *www.toshiba.com*) has a special text mode that automatically sets the camera's controls for optimized text document image capture.—*Bruce Brown*

Save on Ink Jet Cartridges

Ink jet printer ink cartridges are expensive. Is there any way to cut down on the cost?

George Thiere
Tyson, Maryland

Printer companies make more money on ink cartridges than they do selling low-cost printers. You can control costs somewhat by choosing printer models that use the same consumable supplies; that way you can benefit from possible quantity discounts, limit the number of cartridge types you have on hand, and avoid supply imbalances. All Lexmark's ink jet printers use the same cartridges, which is great for supply management.

Other ways to reduce ink consumption are to use lower-quality printing modes for document drafts and to print graphics and other color items in black and gray scales until you print final versions. Also be sure to switch to black cartridges for text printing with

three-color ink jet printers and preserve partially used ink cartridges in humidors supplied by the printer manufacturer. Some people refill their ink jet cartridges on their own to save money, but printer manufacturers don't recommend it.—*BB*

Interfacing the Music

I have been told that to record audio CDs, the recorder should have a SCSI connection. Is this true?

Martin Pineiro
via the Internet

The problem occurs when you try to record directly from an audio CD on a CD-ROM drive to a CD-R (or CD-RW) drive when both are IDE devices. The IDE interface is not able to stream the data reliably, and you can get static and clicks in the copy. One solution is to make an image of the original disk on your hard disk and then record that image onto the CD-R. Or you can get a SCSI CD-R drive, which should be able to read the data directly from the IDE CD-ROM without errors.—*Alfred Poor*

Avoid Color Bands when Printing Gradients

I own an Epson Stylus 640. When I print out a full page design with gradient fills, the color transitions aren't smooth: Distinct bands appear in the printout. This doesn't happen when the image is smaller. I've tried increasing the resolution, but that doesn't help. Is something wrong with the printer?

Michael Wainwright
Oakland, California

Relax, nothing is wrong with your printer. Whenever you print a gradient, it consists of color bands that gradually transition from one hue to the next. At small sizes, the bands aren't noticeable. But at large sizes, or in those cases where the colors at either end of the gradient are too similar, the bands become visible. Increasing the resolution of the printout is a good first step. In addition, you should turn on error diffusion in the *Printer Properties* dialog box. Error diffusion uses a random dither pattern to minimize horizontal banding. As a last resort, you can choose colors with more contrast to provide more transitional hues for the gradient.—*Luisa Simone*

choice in interface will yield the same throughput in most circumstances—at least on a single-user system. In some cases, a SCSI drive will even be slower than an otherwise identical IDE drive. One of the advantages of SCSI drives on a network is that the interface can handle simultaneous data requests efficiently by processing them in the order that needs minimum head movement and drive rotation. On a single-user system, the overhead involved in this processing can slow the drive enough to give an IDE drive the advantage in throughput.

One reason the myth about SCSI drives being superior survives is that manufacturers tend to make their faster drives available with a SCSI interface before they become available with an IDE interface. IDE drives occasionally leapfrog ahead of SCSI drives, however, and there is always a substantial overlap in performance, with the fastest IDE drives offering better performance than slower SCSI drives, usually at a lower price than equivalent SCSI drives. So unless you insist on the best performance available, and the best performers at the instant you buy your hard disk are SCSI drives, there's little reason to choose SCSI over IDE.

You can carry this a step further and argue that you should stay with IDE drives to save money over SCSI. However, there can be real benefits to mixing the two.

BETTER BACKUPS

Consider the case in which you want to use your second hard disk to back up the first—whether by way of a mirroring program or by simply backing up to the second drive incrementally as you work. One reason to use a hard disk for backup is that if your primary hard disk fails, you can reboot and work from the second drive. If both use the same interface, however, getting your system to boot from the backup drive can be more difficult than it has to be. With two SCSI drives, you have to change the SCSI IDs for the drives because the system will want to boot from the drive with the lower ID number. With two IDE drives, you'll have to change the master and slave settings on the drives. In either case, you'll have to open up your system to get to the drives, and then fiddle with jumpers.

If the main drive is IDE and the backup is SCSI, however, switching to the backup drive is simple. To use the two types of drives together, you ordinarily have to boot from the IDE drive. Most SCSI controllers today have the flexibility to let you set up the SCSI drive to boot or not, depending on whether there's an IDE drive present. (You may have to experiment with the settings a bit to get this to work. You should make sure you can accomplish this with the controller card before buying any hardware you can't return. The technique works with every card I've tried, though, except for a few that predate Microsoft Windows 95.) Once the SCSI drive is set up properly, the system will boot from the IDE drive if an IDE drive is installed. Otherwise, the system will boot from the SCSI drive.

To switch between the two, go to the *system setup* screen (see the sidebar "The System Setup Menu"), find the entry for your IDE hard disk, and set it to either *None* (to boot from the SCSI drive), or set it to recognize the IDE drive (to boot from the IDE drive). Reboot. You'll still have to open the case eventually to get the failed hard disk out and replace it, but you can do that at your leisure. In the meantime, you can get back to work immediately.

The System Setup Menu

Here are the details of how to switch between your IDE and SCSI drives: Getting to the setup screen is usually simple. You either hit the computer's Reset button or power-down, then power-up to run the system's power-on self test. You then go to the system setup—typically by pressing the Del key or F2. Most systems will put a message on-screen during the self test to tell you which keystroke to enter for setup.

Setting the IDE drive to *None* should be a simple matter of finding *None* in a list of choices. To reactivate the drive with the correct settings, you should find an autodetect feature that will query the drive and automatically enter the settings. Even so, you should write those settings down before setting the drive to *None* the first time, just in case the autodetect doesn't work.—*MDS*

A VIRTUAL TEST MACHINE

You can also use this ability to switch between drives to effectively give you two systems in one. Assume, for example, that you have a working system with all your programs and data on its IDE drive. You might not feel comfortable putting that system at risk to test a new piece of hardware or software.

Some people buy a second system to use as a test-bed. But you can get the same capability by changing the IDE drive setting to *None* and booting from a SCSI drive that has a separate complete installation of Windows with its own Registry and its own set of installed programs. You can then experiment with new hardware or software with abandon, and not have to worry about something going wrong on your working hard disk.

M. David Stone is a contributing editor of PC Magazine.

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Designing a Data Mart

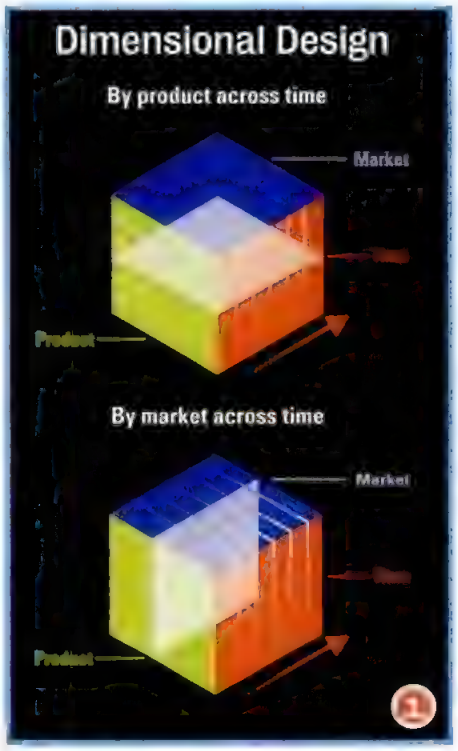
With their tighter focus, data marts are easier to design than data warehouses. We show you the basics. *By Gabrielle Gagnon*

Data marts are by far the most popular and successful data warehouses today. Their tight focus, incremental development approach, and high return on investment make them appealing to competitive business users, harried IT professionals, and cost-conscious managers alike.

Like most data warehouses, data marts are decision-support systems. They differ from larger warehouses in that they are limited in scope, focusing on a single department or business process. This focus enables data marts to be deployed much faster than full-blown enterprise data warehouses, which often take years of analysis and planning.

With consistent formatting, data marts can even be linked together to form a distributed enterprise warehouse. (This is sometimes referred to as the *bottom-up* approach to warehouse design.) In fact, many designers recommend taking such an incremental approach, because although the whole project may take several years, the individual data marts begin performing and adding value right away.

But whether you want to set up a departmental stovepipe that will never connect to anything else or integrate a distributed warehouse across a global enterprise, data marts have fundamental design requirements that differ from operations systems. Let's take a look.



OLTP VS. OLAP

Data marts are not like Online Transactional Processing (OLTP) systems that handle the day-to-day operations of a business. They are decision-support systems that help business analysts identify trends, make comparisons and predict future results. These functions are often referred to as Online Analytical Processing (OLAP).

OLAP functions can't readily be performed on OLTP systems. For one thing, OLTP systems keep only a snapshot of the most current information online; OLAP requires a history of transactions over long periods of time. OLTP systems are constantly being updated and sometimes have missing or erroneous data; OLAP requires static, complete data, adjusted for errors. Finally, OLTP systems process thousands (sometimes millions) of transactions per day; OLAP systems process only one transaction per download cycle—when data is batch-loaded into the system—but may process thousands of concurrent queries per day. (Some people regard queries as transactions, but we don't. A *transaction* takes a database from one consistent state to another, which implies change.)

These differences in function translate to differences in design. OLTP systems typically use the entity-relationship model familiar to relational database administrators. The entity-relationship model normalizes data to minimize redundancy and is optimal for data entry and updates. But OLAP systems are rarely updated by users and are used primarily for queries and reports. While it is possible to design data marts based on the entity-relationship model, many experts recommend using a *dimensional model* instead. The dimensional model organizes data for easy retrieval and is optimal for reporting.

THE DIMENSIONAL MODEL

The dimensional model takes a business process like marketing or sales and organizes it by dimensions, such as products or sales regions. The dimensional model is represented as a hypercube or multidimensional array (see Figure 1). This shows how users can slice and

USER TO USER

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Protecting Palm Data

Many of the people in our organization use Palm PDAs to store information, keep track of contacts, and so forth. How can we make sure that they don't lose their valuable data?

George Hirshon
via the Internet

Deploying PDAs to executives and mobile staff is a great way to boost productivity, but it can often create headaches for IS managers supporting less technical colleagues, who may not understand the limitations of the devices or practice routine backup procedures. This problem can be alleviated by designating one person in the department to regularly update and back up everyone's PDAs.

Companies that issue 3Com Palm organizers to their employees can use BackupBuddy Software's BackupBuddy (single license, $19.95; 5 licenses, $92.50; 10 licenses, $185; 20 licenses, $370; *www.backupbuddy.com*) to secure all applications and data stored in RAM and ROM for multiple users. BackupBuddy modifies the Palm HotSync utility to include backups of all data and programs, and enables you to selectively exclude specific applications. While PDAs are a convenient method of storing and carrying personal and company data, having a centralized backup process protects everyone. A bonus when using this process is that you can quickly load data onto a new device and ship it to someone in the field if a PDA is lost or damaged.—*Bruce Brown*

Resource Allocation

In an organization, all users are not equal in terms of their computing needs. While standardizing on a single platform and vendor simplifies purchasing, inventory, training, maintenance, and support, it isn't cost-efficient to provide the same PC features to all levels in the department.

Production, development, and financial staff, for example, usually need the highest-powered systems with fast processors, loads of memory and storage space, and large, high-resolution displays. Support and administrative staff can often get by with more minimally equipped systems. Executives who are not heads-down, frequent users but need to peruse and

analyze key information may be served best by moderately powered PCs with large displays or even LCD flat-panel monitors. Other aspects of differentiating among user needs include network installations, upgrades, and Internet access. The bottom line—allocate according to need, not job title. —*BB*

In the Cards

The dozens if not hundreds of business cards our salespeople acquire every year are daunting to deal with, yet they contain valuable contact information. Is there any easy way to get that information into a usable form?

Carleen Anders
Boston, Massachusetts

Contact business cards stacked in a pile or stashed in a desk drawer are of minimal value at best, especially when compared with their potential uses if the information were entered into company databases. Business card readers such as Corex Technologies' CardScan Executive ($270 street; 800-942-6739, *www.cardscan.com*) are quick, accurate, and versatile. CardScan Executive, for example, can scan business cards into PC databases, and, via synchronization conduits, into popular contact-management applications and onto 3Com Palm organizers and Windows CE devices.

Rather than buying a card scanner for every employee, departmental solutions include assigning an administrative staff person the responsibility of scanning business cards and distributing the data, or setting up a single PC with a card scanner and software as a business card scanning station.— *BB*

Instant Messaging

One-way pagers are fine for sending alerts, phone numbers, or coded messages, but deploying two-way messaging devices such as the Motorola PageWriter 2000X ($360 plus monthly service charges, *www.motorola.com/pagewriter*) enables message recipients to respond immediately with fixed or customized messages. The PageWriter 2000X can receive numeric, alphanumeric, operator-assisted, and e-mail messages, which enables communication from PCs, telephones, and

dice data any way they choose.

Values in the array are called *facts*, and they are used to measure performance. Descriptions of the facts are called *dimensions*, and they function as constraints or as row headings.

In a sales analysis data mart, facts might be numbers of units sold or total sales, and dimensions might be product names or store locations. Because business analysts want to look at data historically, time is typically also a dimension.

Each block in the hypercube represents a value. Values may be found via any dimension or combination of dimensions. In our sales analysis example, if you wanted to find out how many widgets were sold during the past year, you could sum widget sales along the time dimension. If you wanted to know which sales region performed best overall, you could search regions and find the maximum total sales.

Several OLAP tools work with nonrelational dimensional databases, but many also work with relational databases designed on dimensional principles. OLAP products built for such databases are called Relational OLAP (ROLAP) tools.

STAR SCHEMA

A dimensional model implemented in a relational system is called a *star join schema*, or *star schema* for short (See Figure 2). In a star schema, one central *fact table* contains all of the attributes to be measured. The rest of the tables are *dimension tables*, which contain descriptive attributes. The fact table *key* (or unique identifier) is a composite of all the dimension table keys. This enables the fact table to join to all of the dimension tables. The dimension tables, however, are capable of joining only to the fact table. (Relationship diagrams depict the fact table as being the hub of concentric dimension tables arranged in the pattern of a star, hence the name.)

The simplicity of the star schema makes retrieval very efficient, and this appeals to end users who don't like to navigate through a maze of relationships. Let's take a look at the steps involved in designing a star schema data mart.

BUILDING A STAR SCHEMA DATA MART

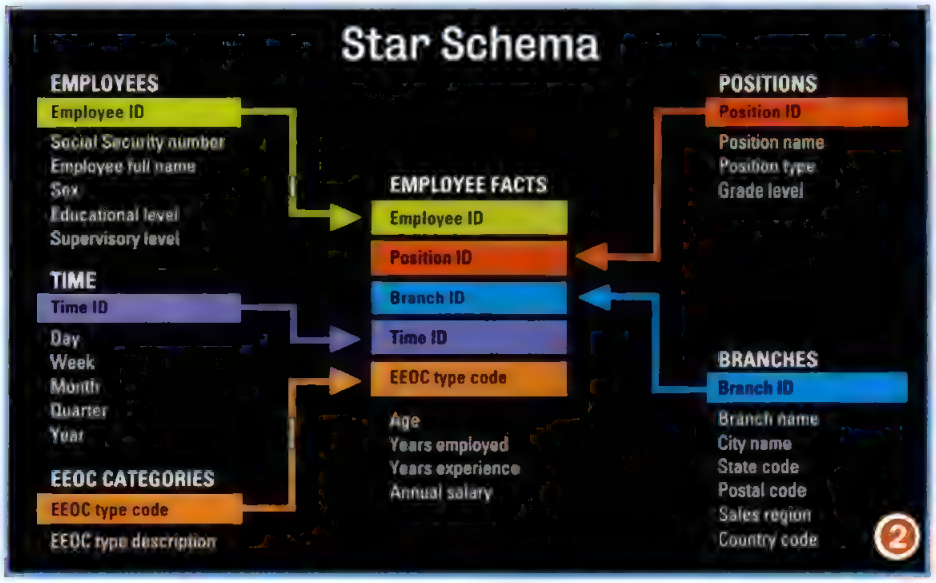
Determine the business process to analyze. The first step in designing a data mart is to decide what business process to model. A business process is a group of related activities that support a business function, such as marketing or inventory. Consider the types of questions users will want the data mart to answer. A sales team may want to measure their performance against that of competitors. A marketing department may want to find out the effectiveness of various marketing campaigns.

Determine facts and dimensions. Once you know what questions the data mart should answer, you can select the facts and dimensions best suited to answer them. What sort of facts work best, and how can you tell a fact from a dimension?

Facts are items to be measured or analyzed. Ralph Kimball, the foremost authority on dimensional modeling, says the best facts are "numeric, continuously valued, and additive."

Numeric facts represent quantities. (They don't include items like social security numbers or zip codes, which can be classified as numeric data types to enforce integrity rules.) Numeric facts can have various mathematical operations performed on them; they are easy to measure.

A *continuously valued* fact can be any one of a range of values, and it usually changes frequent-



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other two-way devices. Because pager addresses are user numbers, not user names, the devices can be distributed as needed, for example, to team members working on a specific project or attending a conference or convention.

With its diminutive keyboard, the PageWriter 2000X isn't comfortable for lengthy typing sessions, but as an extremely portable (6.8 ounces with battery) two-way e-mail and messaging device, it's a flexible and valuable tool for a department's changing needs. Another benefit is that two-way paging can be less expensive than one-way paging, depending on usage patterns. For more information on the advantages of two-way paging, see the User to User column in the Mobile Solutions section of our October 5 issue.—*BB*

Effective Security

Firewalls, password systems, SmartCards, encryption software, and biometric devices can secure your department effectively. These will protect you from intrusion and data theft or corruption, but installing the same security measures on all PCs isn't always the best strategy. Cumbersome security systems are likely to be disregarded or thwarted by users—a common example is when users attach sticky notes with passwords on the sides of their monitors. Security administrators and backup personnel must also be accessible to prevent users from being locked out of vital software and data.

Rather than using a one-size-fits-all security strategy, design appropriate solutions to meet specific business needs. For example, public office locations benefit from biometric security measures—such as the Digital Persona U.are.U, a fingerprint reader ($150 street; 877-378-2738, *www.digitalpersona2.com*)—used instead of passwords, which may be observed and copied. Password-protected applications are more appropriate for less open sites, and SmartCards are perfect for network manager stations or for systems that run financial applications. Encryption software works well for individual users to control access to separate files or applications. Security methods can be combined to increase control but shouldn't be overused.—*BB*

ly. If you counted the number of ice cream cones a vendor sold in one hour on a hot summer day and then counted again an hour later, chances are the number would be different. You wouldn't know the value unless you took the measurement, thus the number of ice cream cones sold would be an example of a continuously valued fact. Continuously valued facts are useful because they always tell you something new. (There's not much point in tracking something that doesn't change.)

An *additive* fact is capable of being added in all the dimensions. For example, in our sales analysis data mart in Figure 1, the number of ice cream cones sold would be an additive fact, because you can add up how many ice cream cones were sold last week (by time); how many were sold in California (by region); and how many were chocolate chip (by product). Kimball favors additive facts because they produce compact result sets. Queries against a historical database can easily scan thousands of records, and the ability to summarize their contents by adding them together is a valuable asset.

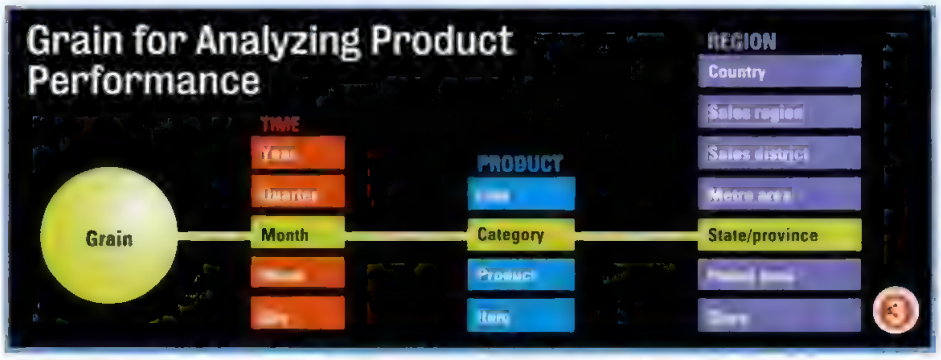
Items that are numeric, continuously valued, and additive are almost always included in facts tables, but not all facts have to fit that profile.

Some facts are *semiadditive*. That is, they may be logically added along some dimensions but not others. For example, it makes sense to add inventory levels by product or by region, but not over time. (The number of vanilla ice cream cartons on hand today plus the number on hand last week is a meaningless calculation.) Although semiadditive facts can't be added across the board, they may be measured in other ways. Averaging inventory levels along the time dimension does make sense, as does finding minimum and maximum levels and some other statistical functions.

Finally, there are *nonadditive* facts. These facts can't be logically added in any dimension. A ratio is an example of a numeric, nonadditive fact. Nonnumeric facts are also nonadditive. Nonadditive facts can't be added, but they can be counted, so they are still measurable. Nonadditive items are more often grouped with dimensions, though.

As we mentioned, dimensions are descriptive attributes, serving as constraints in queries or as row headings in reports. In a star schema, dimensions are also the tables that contain such attributes. Dimensions are usually textual, relatively static, and nonadditive. A person's name and social security number are examples of dimensions. A person's name may change, but it is not likely to change often, and it's not something you'd ordinarily measure. Rather, it tells you about something you might be measuring in the fact table, like employee pay raises.

Distinguishing facts from dimensions is not always easy. Sometimes you might include numeric, additive items, such as unit cost, in a dimension table. And sometimes static or nonadditive values are appropriate in the fact table. It all depends on the application. For example, gender would usually be considered a dimension—it is textual, static, and nonadditive—but if you were designing a human resource data mart and analysts frequently asked questions like "What is the ratio of male to female employees in managerial positions?", you might put gender in the fact table. Even the experts disagree on what goes where sometimes.



Determine the grain. The next step is to determine the *grain*. The grain is the lowest level of detail stored in the data mart.

Information can be summarized on different levels according to hierarchical groupings (see Figure 3). Daily sales can be summarized by weekly, monthly, or yearly totals; items sold may be summarized by product, product category, or product line. Sometimes more than one hierarchy can apply. Stores may be grouped by postal regions for shipping rates or by sales territories for marketing campaigns. You can store both hierarchies in the same dimension.

Data marts let users work with different levels of summary data. The question is, how much detail do users need?

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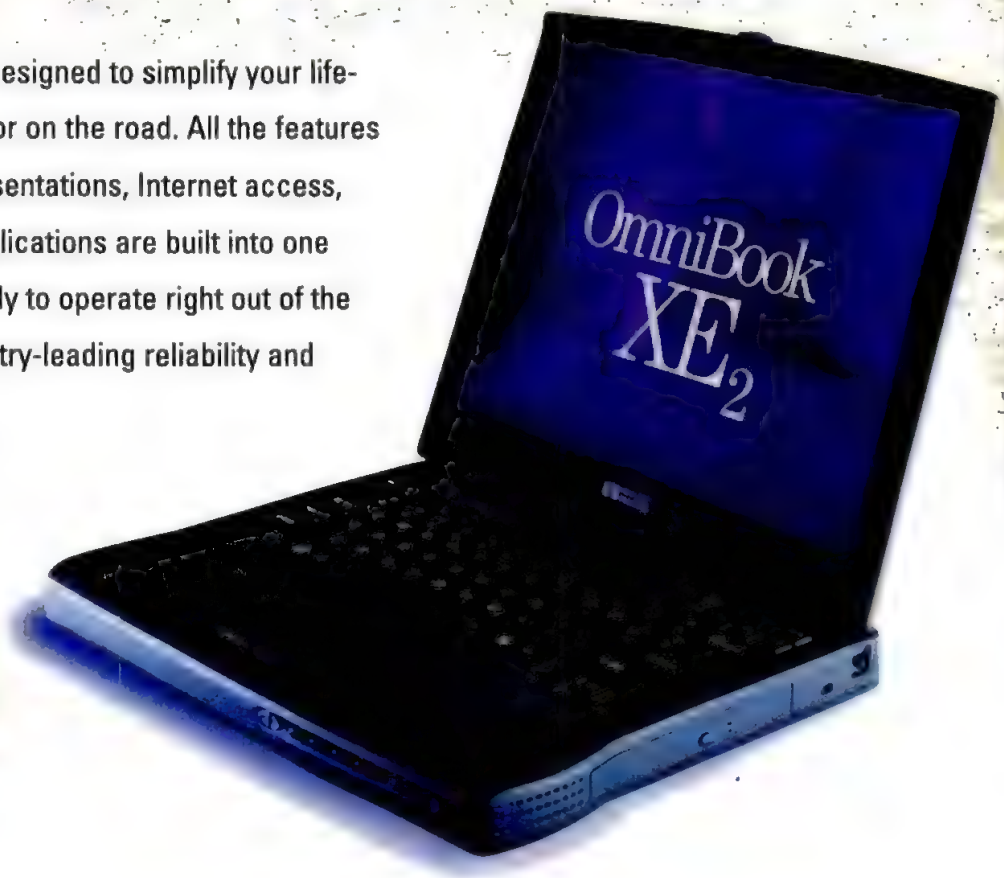

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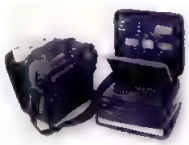

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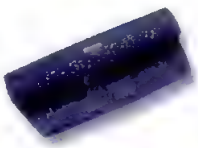

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FoxPro and Y2K Compliance

Is Foxpro for Microsoft Windows 2.6 Y2K compliant? If not, is there a solution?

Jherry Mari
via the Internet

If an application developed with FoxPro for Windows 2.6 contains any code that manipulates dates, it's unlikely that it will work correctly in the year 2000. Without intimate knowledge of your application, however, I can't say for sure. Dates saved in FoxPro DBF files are stored in expanded eight-digit format (19991231 for December 31, 1999, for example), so they're okay. But FoxPro interprets two-digit dates manipulated in code as belonging to the twentieth century if the *Set Century* setting is *OFF*, which is usually the case.

This is a complicated issue. I suggest you read the "Year 2000 Date Support in FoxPro" white paper, available on Microsoft's Web site. Look for it at *www.microsoft.com/technet/year2k/white/vfy2k.htm.—Sal Ricciardi*

might think you should always include the lowest level of detail, but that's usually not necessary and often impractical.

If a company had 1 million customers, and each customer produced ten transactions a month, after five years that would equal 600 million transactions. Assuming each transaction used 200 bytes, transactions alone would need 1.2 terabytes of storage. For trend analysis, you might keep ten or more years online, which would require a minimum of 2.4 terabytes. Thus, even a small transaction file can become very large when viewed historically. And when you add aggregated summary data and indexes, the data mart could easily double or triple in size.

Before buying petabytes of disk space, consider the business questions you're trying to answer, and choose the grain accordingly. If you operate a retail outlet and want to track inventory movement, you don't have to keep every customer receipt in the data mart; you can summarize purchases on the product level. If, you want to analyze customer buying habits, however, you'll need the individual receipts (as well as a way of linking specific customer profiles to the records).

Sometimes the rate of change gives you a clue as to what grain to use: If you were tracking employee pay history, it wouldn't make much sense to use a daily or weekly grain when employees get annual performance reviews.

Organize dimensions into tables. Once you've determined the grain, the question of what other attributes belong in the dimension tables can be answered. Time is always a dimension in a historic data mart, and you should put the time units that apply to your application in the Time dimension table. Days, weeks, months, and years are obvious choices if the grain is on a daily transaction level. Months and years might be all you need if the application grain calls for month-end and year-end summaries. Quarters could be included in financial data marts, and holiday flags might be useful in human resource systems.

In this article, we've offered a fairly general overview of data marts and their uses.. We've only touched on some issues like handling changes over time, and we haven't even mentioned how to select keys. But we hope we've given you an idea of what's involved in designing a data mart and have piqued your curiosity to explore the subject further. PC

Gabrielle Gagnon is a frequent contributor to PC Magazine.

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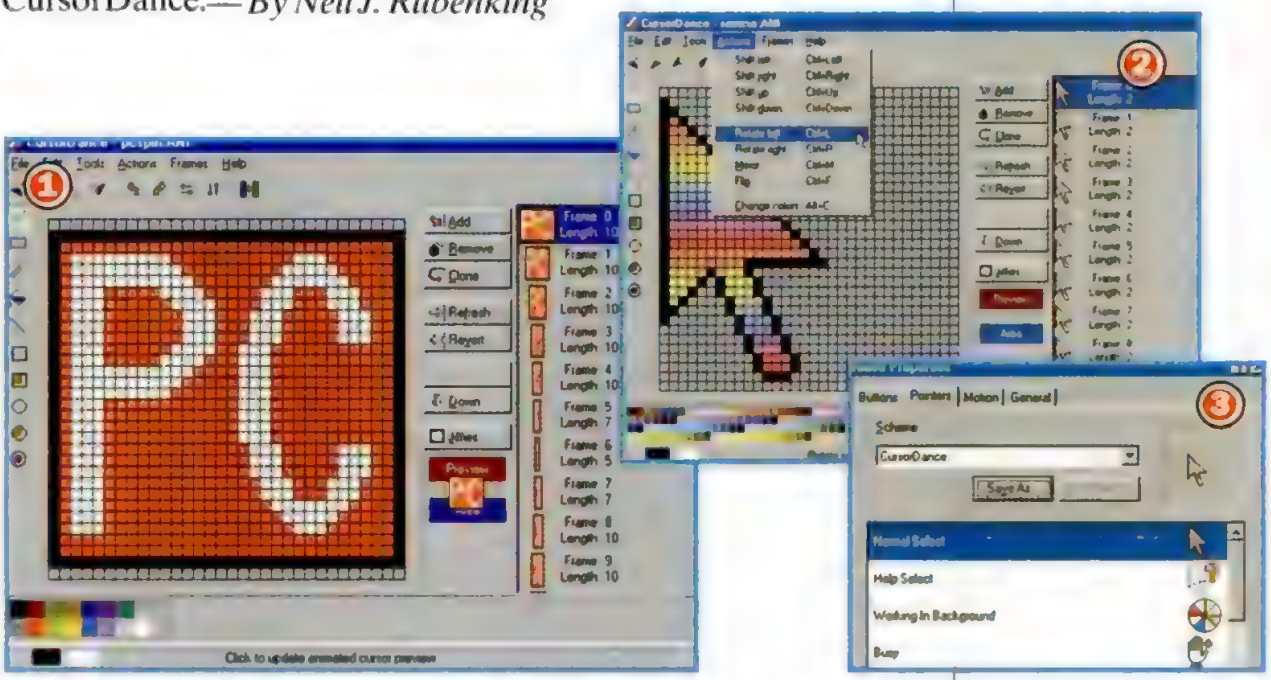
Create Animated Cursors

Design unique animated Windows mouse pointers with CursorDance.— *By Neil J. Rubenking*



Do you ever have trouble finding the mouse pointer on your 25-inch monitor? Wouldn't it help if the cursor were twice as large and had an animated rainbow flowing through it? The Mouse applet in the Microsoft Windows Control Panel lets you define the static or animated cursors that Windows will use for more than a dozen standard occasions—for example, normal select, help select, and working in background. Windows comes with a variety of options, but most of them lack color and only a few are animated.

CursorDance lets you easily design your own colorful, animated cursors, which you can then install using the Mouse applet. The program comes with a variety of sample animated cursors, along with instructions on how to achieve various effects. It also includes a wide selection of image- and animation-editing tools, and a preview area where you can test your cursor.

CursorDance runs on Windows 95, 98, and NT 4.0. An article about how to use CursorDance and how it was written is available on our Web site at *http://www.pcmag.com/utilities*. A link to download the utility and its Delphi 5 source code can also be found there.

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Neil J. Rubenking, author of CursorDance, is the contributing technical editor of PC Magazine. *Sheryl Canter is the editor of the Utilities column and a contributing editor of* PC Magazine.

1. Animated cursors are composed of multiple frames displayed in sequence. If you place the cursor over CursorDance's preview area, you can see what the animation will look like. In the sample cursor shown here, the PC logo appears to spin.

2. CursorDance's *Actions* menu includes advanced editing commands that let you shift, rotate, flip, or create a mirror image of the cursor display. The *Change Color* option replaces all occurrences of the foreground color with the background color, which produces a reversing effect.

3. The Mouse applet in Control Panel lets you set the cursors that will display for more than a dozen standard circumstances.

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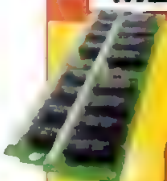

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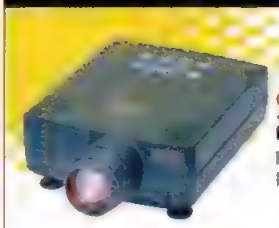

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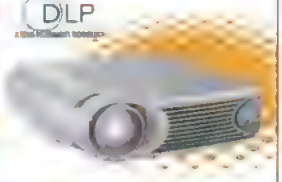

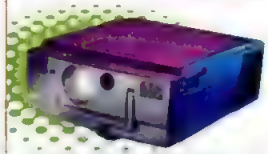

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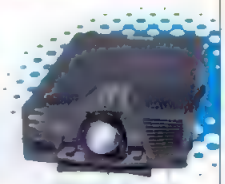

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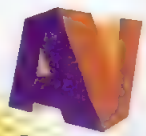

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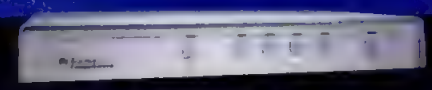

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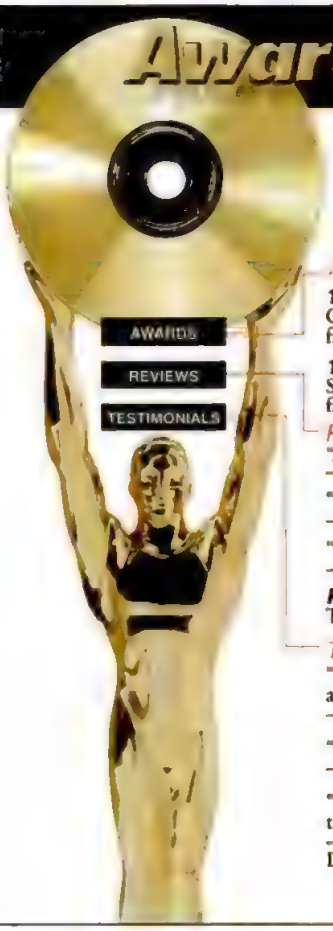

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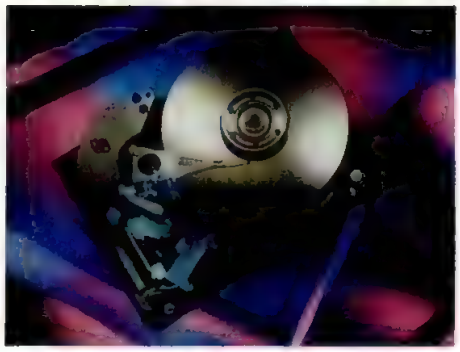

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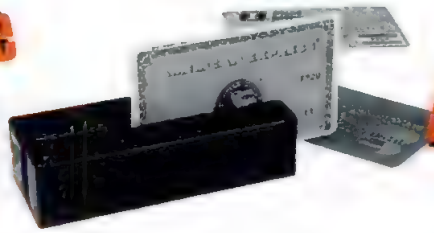

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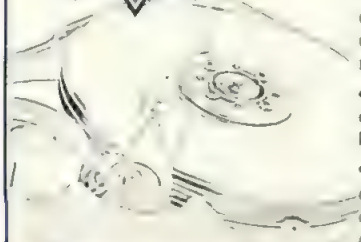

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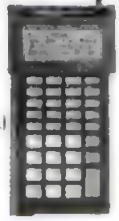

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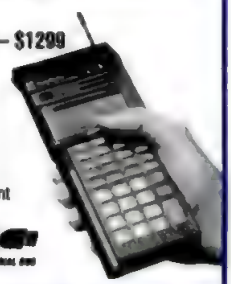

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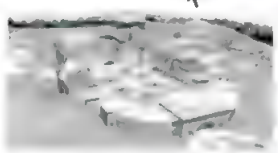

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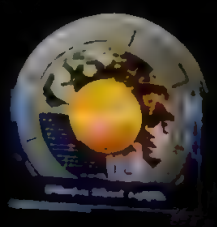

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I, Architect

By Daniel Grotta
and Sally Wiener Grotta

3-D home design software takes your dreams for your home and turns them into blueprints and 3-D models. This not only helps you better visualize what you want done, but it also helps you to communicate your vision effectively to an architect or contractor.

We tested four 3-D home design packages: Data Becker's Complete Home Designer 3.0, IMSI's FloorPlan 3D Design Suite 5.0, Sierra Home Architect 2.0, and Broderbund's Total 3D Home 1.0. All use drag-and-drop manipulation of "objects" (walls, windows, doors, furniture, and so on) to define your design. Start from scratch, or open up one of the programs' model homes and edit from there. The programs even convert 2-D to 3-D, so you'll be able to stroll through the rooms you've designed. The focus of these products, though, is on helping you design and furnish individual rooms, suites, or additions; they are not for creating an entire house.

To test these titles, we used each program to build the same two-story family room and bedroom addition. Though each application brings its own particular strengths and disadvantages to the design process, our Editors' Choice goes to IMSI's FloorPlan. Though not as much fun to use as Sierra Home Architect, FloorPlan consistently performed every function we required of it smoothly and with no hassles.

Complete Home Designer 3.0

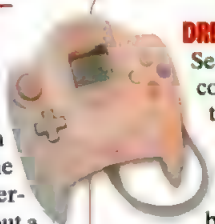
With remarkable 3-D and animation options, Data Becker's Complete Home Designer 3.0 is a powerhouse of a program. Without a doubt, the image of the dream house you design with this software will look better than with any of the other titles in this story. Getting to that final result, however, can be difficult, even for experienced users.

Working in Complete Home Designer can be cumbersome. Once you draw the four walls of a room, for example, you cannot edit their sizes without deleting a wall, because the dimensioning lines do not update their measurements when the plan is edited. Objects are also clumsy to place, with no inherent alignment to the walls or to each other (we even ended up with a toilet inside a wall).

On the other hand, the program's libraries of objects are impressively extensive and even include landscaping, decks, and exterior lighting. The problem is finding the one object you want out of the thousands in the poorly organized, nonsearchable library.

The Construct and Furnish modes are thoroughly separated. You create walls and place windows and doors in Construct mode. Everything else is placed in Furnish mode. So if you are furnishing a room and decide you want to move a window, you have to go back to Construct. This puts a crimp in workflow. More important, when an object is selected in Furnish mode's default 3-D view, the guiding handles are so large you can't see where one object ends and another begins.

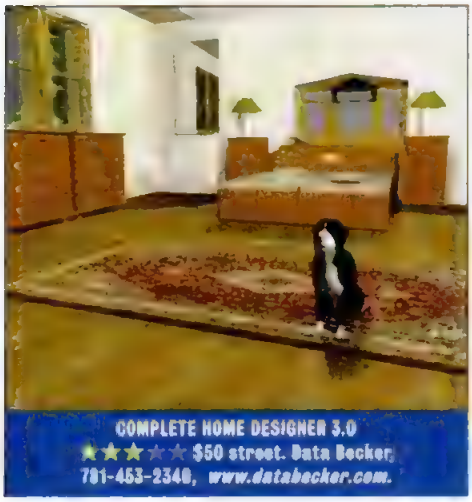
Complete Home Designer shines in 3-D rendering and its



DREAMCAST
See Sega's dreams come true with the Dreamcast, the first game console with Internet capabilities. *Page 244.*

PANDORA'S BOX
Check out the newest game from the inventor of Tetris. *Page 246.*

ILLUSTRATION BY TOM GARRETT



COMPLETE HOME DESIGNER 3.0
★★★☆☆ $50 street. Data Becker,
781-453-2340, www.databecker.com.

unique animation. Among the objects are animated characters and animals, which can be edited by keyframe and included in a walk-through AVI movie. Rendering includes time-of-day illumination, light fixtures that can be turned on or off, realistic shadows, and even mirrors that reflect. The high degree of control and the quality of the rendering engine give superb results.

If you need to present your plan, then the excellent quality of the rendered still image or AVI movie may be worth the frustration. Otherwise, Complete Home Designer is simply missing too many basics.

FloorPlan 3D Design Suite 5.0

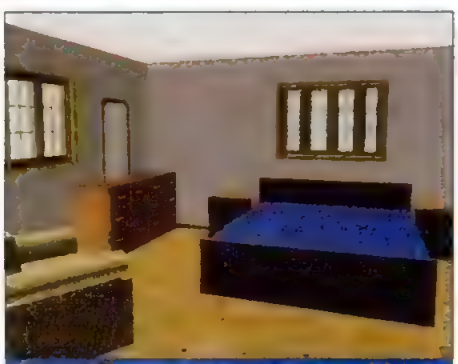
PC MAGAZINE EDITORS' CHOICE

IMSI's FloorPlan 3D Design Suite 5.0 is an unintegrated suite that includes HomeStyles' Home Designs Encyclopedia, 3D Garden Designer, and TurboProject Express (for project management). But our testing focused on the suite's central home design program, FloorPlan, which is intelligent, convenient, and well designed.

With FloorPlan, defining rooms precisely becomes easy work. As you draw the walls and cabinets, you can control their length and angle via a status bar. When you edit walls or place windows, doors, and cabinets, the dimension lines are displayed on the plan automatically. And when rooms are created, their square footage is instantly calculated and displayed.

The program's library of structural objects is large and well organized, with large previews. The number of furnishing objects, however, is limited. (IMSI promises to have objects, textures, and materials available for download from its Web site by the time you read this.) Everything is displayed on the workspace rather than being buried in a menu. On the left side of the workspace are tabbed views of PlanView, 3D, and the Internet, which provides direct access to the Web. Depending on which tab is active, the workspace view changes. Also, FloorPlan's database of objects and materials can be trimmed, added to, and reorganized.

Objects align automatically with the wall and each other, though table lamps start out on the floor. In preparation for Web functionality, the program lets you define any object in your plan with a hyperlink.



FLOORPLAN 3D DESIGN SUITE 5.0
★★★★☆ $50 street. IMSI,
415-257-3000, www.imsisoft.com.

Although FloorPlan usually functions smoothly and effortlessly, it sometimes requires too many mouse clicks to perform a simple operation. For instance, each wall must be assigned a color or material individually.

Rendering options include ray tracing, geographical location, time of day, month, and more. But the end result, while decent, doesn't have the detail of Data Becker's Complete Home Designer's renderings. The rendered image is saved when it is created, but only as a bitmap. Animated walkthroughs export as 3-D VRML files, so they can be viewed with any current Web browser.

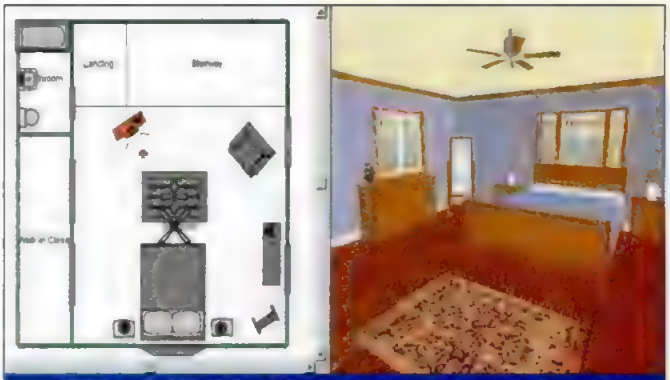
As you work on your plan, a materials list is generated, but you have to input the prices to have your total costs calculated.

According to IMSI, when its Internet site is fully enabled later this year, as you power up FloorPlan, you'll be automatically informed about available updates, downloadable content, and applets (for calculating paint amounts, for example).

FloorPlan is a winner. Though the program is not as much fun to use as Sierra Home Architect nor as good at rendering as Data Becker's Complete Home Designer, FloorPlan doesn't let technology get in the way of productivity and creativity. If you're serious about home design, FloorPlan is right up your alley.

Sierra Home Architect 2.0

Versatile and easy to use, Sierra Home Architect 2.0 is also the most fun of the programs in this roundup. A bit of unevenness in object alignment, however, subtracts from its value. Home Architect is bundled in Sierra's Complete Home 2.0 ($50 street), which also includes Photo Home Designer, 3-D Deck, Electrical Wiring, and Home Improvement Encyclopedia.



SIERRA HOME ARCHITECT 2.0 (bundled in Sierra's Complete Home 2.0)
★★★☆☆ $50 street. Sierra Home,
800-545-7677, www.sierra.com.

Home Architect's intelligent and easy-to-navigate interface displays dynamically linked side-by-side 2-D (blueprints) and 3-D views that automatically update each other when one is edited.

Moving about in Home Architect's 3-D view is easier than with any of the other programs reviewed in this story. In the current version, however, you can't render the scene. The upcoming Version 3.0 will have ray-trace rendering.

Tabs at the top of the screen clearly delineate and organize a large library of attractive structural and furnishing objects. In addition, a button automatically connects you to the Sierra Home Architect Digital Collection

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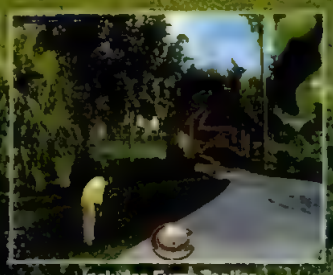

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Web site for free new content, which Sierra updates monthly.

The Quick Design wizard helps you create rooms individually for later assembly. Short videos (which can be turned off) guide novices throughout the program.

Most objects align correctly, but not all. Cabinets snap to each other and to the wall quite nicely. And table lamps actually go right on the table surface rather than the floor. But a bay window insisted on fitting into a wall backward, with the convex surface facing inside.

Creating a stairway is remarkably awkward, and the result doesn't necessarily reach the next floor. First, you have to make a room in the first floor and remove a wall and the ceiling, then place another room that is exactly the same size over the first and remove its floor and a wall. Next, you create a third room and remove two walls for the upstairs landing. After all that's done, you put in the stairs. There's no provision for making sure that the stairs fit the space, which explains why they sometimes come up short.

Home Architect automatically generates a shopping list of materials your plan will require, including average installation prices. The integrated design guide offers advice on planning and budgeting a remodeling project. You can export your plan in DXF format for use in an architect's CAD program.

Home Architect's handful of important objects that misbehave (such as those mentioned above) limit its capabilities. Still, the program is so much fun and so easy to use that you'll find yourself experimenting with all kinds of room decors and layouts. It's a good choice for novices.

Total 3D Home 1.0

Broderbund's Total 3D Home 1.0 fully integrates all aspects of designing and remodeling a home in a single easy-to-use interface. Its streamlined (though sometimes limited) functionality also makes it the title in this roundup that gets you from start-up to basic finished plan the fastest.

Its various modes include Planning, Decorating, Shopping, Budget, and Online. All five function through the same workspace and integrate effectively.

In Planning mode, you build a house, room by room, on any story, with simple drag-and-drop operations. Resizing rooms involves dragging on the walls, whose measurements are dynamically displayed. Total 3D Home offers similar direct, intuitive manipulation throughout the program.

The workspace offers tabbed views of your plan in 2-D and 3-D, updating these views as you edit. Options display in a panel to the right of the workspace.

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Broderbund takes simplicity too far, however. File saving and opening are dumbed down so far as to be crippled. When you save a plan, you can't choose where it goes on your computer. Also, the 3-D rendered view is too simple and can't be saved.

Working with Broderbund's objects is a pleasure; they automatically align correctly and offer a versatile array of options. For instance, Total 3D Home treats stairways as a type of room, automatically making them reach to the next floor and putting walls in the right place. The wall underneath the stairs can be invisible, angled, half-height, or full.

Though the current libraries of structural and decorative objects are too limited, the Shopping mode has more than 20,000 brand-name products. This useful mode lets you find lots of information—including size, price, and more—about available appliances and furniture. Broderbund promises that the next edition of Total 3D Home (available later this year) will include more objects.

The Decorating mode features interactive photos of sample rooms in which all furnishings are clickable objects and you can experiment with different materials and styles.

The Budget mode lists all the materials used in your plan and prices them for you. This mode also includes a labor worksheet.

The Online mode connects you to a Web site, where there are links to idea, product, and labor sources, as well as articles written by experts. GoodHome .com, the developer of Total 3D Home, plans on greatly expanding its site's functionality by the time the next version ships.

Total 3D Home is a smooth, trouble-free program. But it needs to improve its rendering and file operations, and continues to expand its library of objects to reach the level of IMSI's FloorPlan.

GAME CONSOLE

Sega Dreamcast

Previous console gaming systems had no hope of competing with PC graphics. The Sega Dreamcast's amazing lifelike graphics, however, not only handily beat the Nintendo 64 and Sony PlayStation console systems, they even challenge PC performance.

SEGA DREAMCAST
★★★★½ $200 street, Sega of America Inc., 800-872-7342, www.dreamcast.com.

The Dreamcast competes with PCs in another significant way, by being the first game console to deliver Internet access. Sega gamers can now surf the Web, upload and download saved games, chat, and send and receive e-mail.

To access the Internet with the Dreamcast, you can use the bundled CD to sign up with AT&T WorldNet or use your own ISP. The Dreamcast works with most national ISPs but not with America Online.

We tested the Dreamcast's Internet capabilities by dialing up with EarthLink. When you access the Internet, Sega immediately sends you to the Dreamcast Network home page, where you'll find links for game and accessory information and be able to e-mail and chat with other Dreamcast players. You can also enter Web site URLs—one letter at a time via a pop-up keyboard and cursor, which gets tiresome very quickly. Internet response varied depending on network traffic and time of day.

The U.S. version of the Dreamcast has the same specs as the Japanese version released in November 1997: Microsoft Windows CE, a 200-MHz SH4 CPU, 16MB of main memory, 8MB of video memory, 2MB of audio memory, a 128-bit graphics engine, and a 64-channel audio processor. The modem has been bumped up from 33.6K to 56K.

The Dreamcast handles up to 3 million polygons per second, from a color palette of more than 16 million colors, and runs at 60 frames per second. The media reader is a special CD-ROM drive capable of reading GD-ROM disks, which hold 1GB of information—350MB more than normal CDs. The added space means that extra elements, such as animations, can be added to games. For example, Sega's NFL 2K ($50 street) includes more than 1,600 motion-capture animations for unprecedented realism.

Sega has also made available tiny Visual Memory Units ($25 street each) with their own 48- by 32-pixel monochrome LCDs. These memory units plug into Dreamcast controllers for game storage and game swapping. You can even use them to play mini versions of some Dreamcast games.

The Dreamcast package includes the Dreamcast itself, one controller, 80-inch audio/visual and power cables, a game demo disk, and Web browser software.

The off-white Dreamcast console measures 2.8 by 7.3 by 7.5 inches (HWD). Four controllers can be plugged into the front for multiplayer games (extra controllers cost $30). AC power, A/V, and modem ports are on the back, plus a serial port for future accessories. An external proprietary keyboard (available later this fall)—the need for which becomes immediately apparent if you use the Dreamcast's Internet access feature—will cost about $20. Other expected accessories include a fishing controller, a racing wheel, arcade sticks, and light guns.

The standard controller has a 6-foot cable, four action buttons, two triggers, an analog joystick, a digital pad button, and a start (and pause) button, plus two slots for a Visual Memory Unit and a Jump Pack (an optional $30 force-feedback unit). To install the console you simply plug the A/V cable into a television's or monitor's video and audio input jacks, set the display to the proper video mode, drop in a game CD, and start playing.

Games we tested included full versions of Activision's Blue Stinger, House of the Dead 2, Midway's Hydro Thunder, NFL 2K, and Sonic Adventure ($50 each, street).

The Dreamcast's combination of graphics and speed creates a world that pulls you into the game. Blue Stinger combines an entrancing story line and an awesome cinematic feel with frequent cut scenes and extensive dialogue that'll make it tough to put down the controller. Realistic elements in the games include light sourcing, shadowing, and textures.

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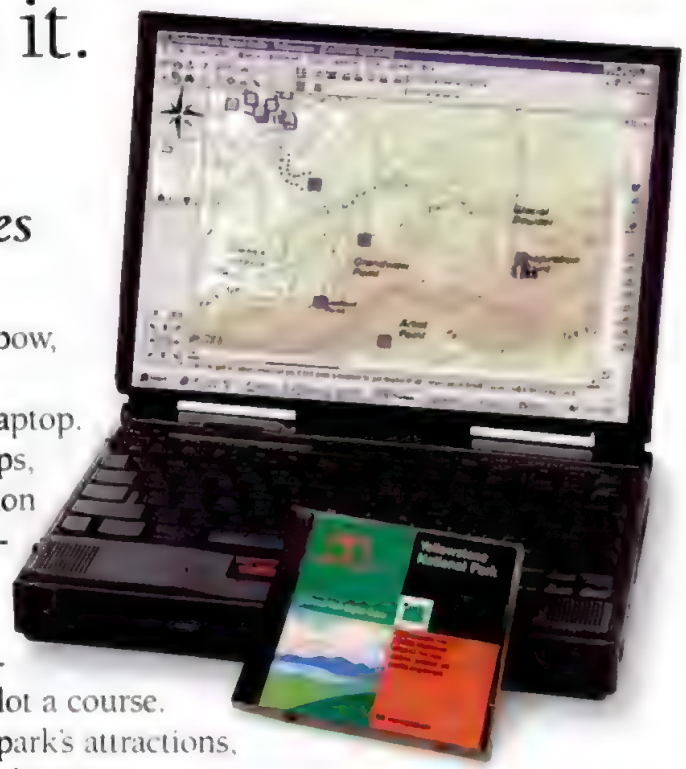

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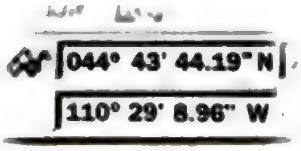

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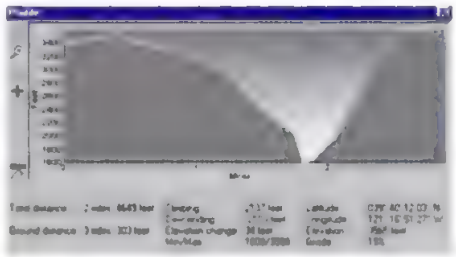

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ing television. In games on earlier console systems, including the Sony PlayStation, when a person talked, only the mouth moved. With the Dreamcast, the whole face is articulated and moves when a character speaks and when eyes close.

Sony has announced the PlayStation II (its tentative title) for release late next year. The PlayStation II is set to have similar features to the Dreamcast plus DVD support, but with that product approximately a year away, the Dreamcast is the console of choice for the foreseeable future. Sega's head start should let it gain market share currently dominated by Sony and Nintendo. On the product launch date, 18 games were available for the Dreamcast. One advantage that will speed delivery of games for the Dreamcast is that Sega arcade games can be ported easily to it.

Although the current game selection is impressive, it's regrettable that no network-playable games are immediately available. Sega promises to introduce several network games during the next year. Even limited to local game play, however, the Dreamcast is the hot item for gamers, hitting levels of graphics and audio performance previously unrealized in console and PC gaming. *—Pete Brown*

PUZZLES

Pandora's Box

Alexey Pajitnov's Tetris has sold over 50 million copies since its release in 1984 and is now a household name. Hoping for similar success, Microsoft is banking on Pajitnov's newest effort, Pandora's Box, to do for the casual gaming market what Tetris achieved for early PC adoption and handheld gaming.

Pandora's Box is an elegantly presented collection of puzzle games, with 10 puzzle types and over 350 variations. Though each type of puzzle is new, all of them are variations on familiar sliding tile and jigsaw puzzles.

A loose story line provides extra motivation. Pandora's box has been opened and seven different tricksters from world mythology have escaped, taking pieces of the box with them and scattering them in 34 cities around the world. Although you can choose to access any puzzle in the Puzzles Only game play mode, the object of the story line mode is to travel from city to city, collecting the pieces and recapturing the tricksters by solving the puzzles.

All the puzzles are visually oriented and require you to rely on associations and intuition, as opposed to some other puzzle games that emphasize hard logic. Each puzzle type is centered around arranging the pieces of a cultural image or artifact.

Once a puzzle is solved (there are ten in each city), you are rewarded with a credit, a hint bonus, or a piece of Pandora's box. Cashing in ten credits will instantly solve any puzzle that gives you too much trouble.

Pandora's Box is enjoyable visually as well. Most of the images are unfamiliar and original, even the ones from New York City and Paris. Though on average the puzzles aren't difficult enough to be too frustrating, some are challenging, especially at the higher levels. One ding against Pandora's Box: It's not very replayable. You find the same puzzles each time you start the game. And if you're a hard-core gamer, you're probably looking for something more complex.

Pandora's Box has a mild form of copy protection: Even if you loaded the entire CD onto your hard disk, you would still have to insert the CD as a key disk each time you started the game. Microsoft says all future games will have the same protection, meaning that users of subnotebook PCs without integrated CD-ROM drives might be left out in the cold.

But Pandora's Box is not designed for marathon game sessions. Instead, casual gamers who kill 15 minutes here and there with games like Hearts or FreeCell will find Pandora's Box a welcome and polished replacement.—*Rich Brown* PC

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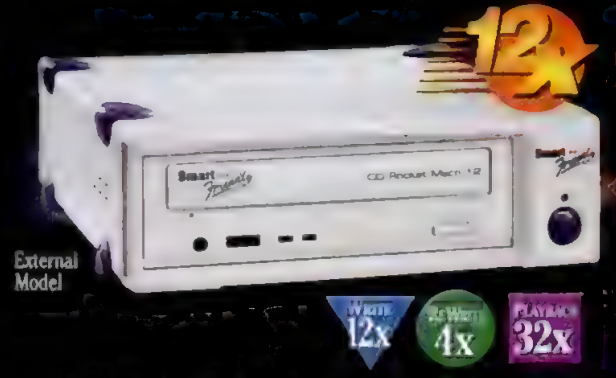

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CTVTM57A	AMD K6-2/400 3DNow!	15"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Micro-ATX	$23/Month	$779.99	$379.99
CTVTM51A	Celeron 500MHz	15"	96MB PC 100	8GB UDMA	32X	AGP/8MB	ATX	Mid-Tower	$26/Month	$829.99	$429.99
CTVTM29D	Pentium III 450	17"	96MB PC 100	8GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	$39/Month	$959.99	$559.99
CTVTM39	AMD K6-III/400 3DNow!	17"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	$30/Month	$999.99	$599.99
CTVTM42B	Pentium III 450	17"	128MB PC 100	13GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	$39/Month	$1069.99	$669.99
CTVTM47	AMD K6-III/450 3DNow!	17"	128MB PC 100	20GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	$34/Month	$1139.99	$739.99
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CTVTM45B	Pentium III 550	17"	128MB PC 100	20GB UDMA	40X	AGP/8MB	ATX	Mid-Tower	$43/Month	$1429.99	$1029.99
CTVTM46A	Pentium III 600	17"	128MB PC 100	20GB UDMA	40X	Voodoo 3 AGP/16MB	ATX	Mid-Tower	$50/Month	$1679.99	$1279.99

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Edited by Don Willmott

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Actually, this Y2K thing is getting *really* out of hand! (*Lindsay* [Oklahoma] *News.*)

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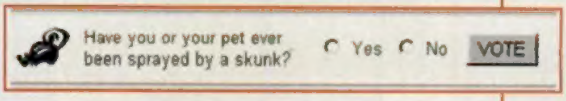

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LET'S SEE, POWER OR CONVENIENCE? CONVENIENCE OR POWER?

[OH HECK, TAKE ONE SCOOP OF EACH.]

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